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NINETEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF MICHIGAN,

FOR THE

FISCAL YEAR ENDING JUNE 30, 1891.

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

NEW YORK HOSPITAL
1894

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1894.

Office of the Secretary of the State Board of Health,
LANSING, MICHIGAN, *December, 1892.*

TO HON. JOHN T. RICH, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying Report for the fiscal year ending June 30, 1891.

Very respectfully,

HENRY B. BAKER,

Secretary of the State Board of Health.

26713

RESOLUTION OF THE BOARD RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

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REPORT.

This is the Nineteenth Annual Report of the Secretary of the Michigan State Board of Health, and is for the fiscal year ending June 30, 1891. It is arranged and paged in two parts. The first part contains the Secretary's report of the work of the Board, of the work in the Office of the Board, and the annual report of property, including accessions to the library, with names of donors. The second part contains papers, abstracts, and reports —including one on the "Principal Meteorological Conditions in Michigan in 1890," one on "The Time of Greatest Prevalence of Each Disease," being a Study of the Causes of Sickness in Michigan, especially in 1890, one on the dangerous "Communicable Diseases in Michigan in 1890" —relating to Diphtheria, Scarlet Fever, Typhoid Fever, Small-pox, Measles, Whooping-Cough, Consumption, Glanders, Rabies (hydrophobia), Anthrax, Actinomycosis (lump-jaw), one on "Cheese-poisoning," one on "Injuries and Loss of Life and Property from the Use of Kerosene," one on "Injuries and Loss of Life from the Use of Gasoline," and one on "Alleged Nuisances in Michigan in 1891."

Some of these reports include the immensely extensive and valuable statistics on the subjects of sickness, meteorological conditions, etc., collected at the office of the State Board of Health.

The publication of this Report has been much delayed by several causes, including the inauguration and prosecution of new lines of work which have seemed to be demanded, and the natural increase of the work, due to increasing population of the State and more especially to increasing attention to sanitary affairs throughout the State, the office force not having been increased correspondingly, and one valued employee having been lost by death.

Under the law, the Secretary of the Board is required to disseminate information "through an Annual Report and otherwise," and, by direction of the Board, he issues immediately after the close of each week a bulletin which shows the sickness during the week just passed; also a monthly bulletin; and sometimes publishes quarterly proceedings of the work of the Board and the condition of health in Michigan during the quarter. The proceedings of sanitary conventions are published as soon as practicable after the occurrence of each convention.

Thus items of sanitary work in Michigan which are regarded as useful "news" are published at once in the comparatively ephemeral bulletins, etc., while the Annual Report is not issued, as a newspaper or journal is, as an ephemeral publication, but as a permanent official record of the work of the State Board of Health, and in the office of the Board, and of the local boards of health throughout the State. The Annual Report contains also statistics which require a great deal of painstaking care in their preparation, but which it is hoped will be useful, for all time to come, to those who study the causation of diseases; and through their labors, to the people of the State and country; and the statistics are there preserved in a permanent form, accessible, for purposes of study, to a comparatively large number of persons.

However, only about six thousand copies of the Annual Report are printed, to supply the two millions and more inhabitants of Michigan; and only 3,500 of those copies are at the disposal of the State Board of Health. Of these, some are sent to libraries, some are sent in exchange for the publications of other State Boards of Health, of prominent city boards of health, of sanitary journals, etc.; others are sent to persons likely to make good use of them, including each of the fifteen hundred health officers in Michigan.

To this Report there are four Supplements, containing proceedings and addresses at the Sanitary Conventions held at Alpena, Charlevoix, Centreville and Niles.

The papers in the Supplements as well as those in this Annual Report, are printed subject to a resolution of the Board, printed on page iv.

The names and postoffice addresses of the members of the Board, and the dates of the expiration of their terms of office, are as follows:—

JOHN AVERY, M. D., *President of the Board*, Greenville, Jan. 31, 1893.
ARTHUR HAZLEWOOD, M. D., Grand Rapids, Jan. 31, 1893.
VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor, Jan. 31, 1895.
DELOS FALL, M. S., Albion, Jan. 31, 1895.
MASON W. GRAY, M. D., Pontiac, July 1, 1897.
HON. FRANK Wells, Lansing, July 1, 1897.
HENRY B. BAKER, M. D., *Secretary of the Board*, Lansing.

The members of the State Board of Health, with the exception of the Secretary, are appointed for the term of six years, and receive no salary or *per diem* compensation for their services.

STANDING COMMITTEES.

1. Epidemic, Endemic and Contagious Diseases.—A. Hazlewood, M. D.
2. Sewerage and Drainage.—A. Hazlewood, M. D.
3. Food, Drinks and Water-Supply.—V. C. Vaughan, M. D.
4. Buildings, including Ventilation, Heating, etc.—John Avery, M. D.
5. Climate, Geology, Topography, etc.—Henry B. Baker, M. D.
6. Disposal of Excreta.—Mason W. Gray, M. D.
7. Poisons, Explosives, etc.—V. C. Vaughan, M. D.
8. Occupations, Recreations and Habits.—Hon. Frank Wells.
9. Relations of Schools to Health.—Delos Fall, M. S.
10. Sanitary Survey.—Delos Fall, M. S.
11. The Death-Rate as Influenced by Age.—Henry B. Baker, M. D.
12. Legislation.—John Avery, M. D.
13. Finances of the Board.—Hon. Frank Wells.
14. Mental Hygiene.—Arthur Hazlewood, M. D.
15. Animal's Diseases Dangerous to Man.—Henry B. Baker, M. D.
16. Relations of Preventable Sickness to Taxation.—Mason W. Gray, M. D.
17. Plans for Model School Houses.—Hon. John Avery, M. D., J. H. Kellogg, M. D., and Arthur Hazlewood, M. D.
18. Alcoholic Liquors.—Henry F. Lyster, M. D., Victor C. Vaughan, M. D., and Arthur Hazlewood, M. D.

WORK OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1891.

Aside from the work in committees and in connection with the office of the Secretary of the Board, the work of the State Board of Health itself includes that done at the regular and special meetings of the Board, the holding of Sanitary Conventions, and the examination of plans for public buildings, under Sec. 7, Act 206, Laws of 1881, § 418 Howell's Statutes, amended by Act 86, Laws of 1889.

The Board held three regular meetings at Lansing, and three special meetings, during the year ending June 30, 1891, as follows: Alpena, July 11, 1890; Charlevoix, August 14, 1890; Lansing, October 14, 1890; Lansing, January 13, 1891; Niles, February 5, 1891; and Lansing, April 14, 1891.

SANITARY CONVENTIONS.

Four successful sanitary conventions were held during the fiscal year ending June 30, 1891, as follows:

ALPENA SANITARY CONVENTION, JULY 10 AND 11, 1890.

At the Sanitary Convention held at Alpena, the following program was carried out:—

Address of Welcome, by Michael O'Brien, mayor of the city.
Response and Statement of the Objects of the Convention, by Henry F. Lyster, M. D., of Detroit.
President's Address, by the President of the Convention—Hon. W. L. Churchill.
Letter from Governor Cyrus G. Luce.
Alcohol and Narcotics, in Health and Disease, by J. D. Dunlop, M. D.
  Discussion of the Drink Problem, by Henry F. Lyster, M. D.
Can Consumption be Prevented?—by William E. Ziegenfuss, M. D.
  Discussion—the Prevention of Consumption, by Prof. A. Arnold Clark.
Sewerage and Drainage of Alpena, by F. A. Rice, C. E.
Sewerage and Drainage of Alpena, by Arthur Wilkinson, M. D.
  Discussion—Sewerage and Drainage of Alpena, by Henry F. Lyster, M. D.
  Discussion—the Sewerage and Drainage of Alpena, by Henry B. Baker, M. D.
Alpena—Its Past and Present Hygienic Condition, by A. L. Seaman, M. D.
Disposal of Waste and Excreta in Alpena by Sewerage and Otherwise, by W. A. Secrist, M. D.
Diseases of the Teeth, and Their Effects on the System, by William F. Dunlop, dentist.
Heating and Ventilation, by Prof. F. S. Dewey.
  Discussion—Heating and Ventilation, by Prof. Delos Fall, M. S.
Restriction and Prevention of the Dangerous Communicable Diseases, by Rev. H. H. Van Auken.
Restriction and Prevention of the Dangerous Communicable Diseases, by William E. Depew, attorney.
The Water Supply of Alpena, by Charles Howell, M. D.
  Discussion—the Water Supply of Alpena, by Prof. Delos Fall, M. S.
  Discussion of J. D. Dunlop's paper, Alcohol and Narcotics, by Prof. Delos Fall, M. S.
Sanitary Progress, by A. M. Miller, M. D.
The Restriction and Prevention of the Dangerous Diseases, by Henry B. Baker, M. D.

CHARLEVOIX SANITARY CONVENTION, AUG. 14 AND 15, 1890.

At the Charlevoix Sanitary Convention, the following program was carried out:—

Address of Welcome, by A. E. Mason, President of the village of Charlevoix.
Response, and Statement of the Objects of the Convention, by Hon. John Avery, M. D., Greenville.
How and Where a Resort Should be Located, by Henry Bishop, Kalamazoo.
An Ideal Summer Resort—Discussion by Rt. Rev. George D. Gillespie, Grand Rapids.
Hygiene of Schools, by Prof. H. M. Enos, Charlevoix.
School Hygiene—Discussion by Prof. David Howell, Principal of the College of Liberal Arts, Bay View Summer University.
  Discussion by Prof. Victor C. Vaughan, M. D., Ann Arbor.
  Discussion by J. H. Kellogg, M. D., Battle Creek.
The Restriction and Prevention of Dangerous Diseases, by Henry B. Baker, M. D., Lansing.
The Duties and Compensation of the Local Health Officer, by W. A. S. Williams, M. D., Petoskey.
The Causation and Prevention of Diphtheria, by Arthur Hazlewood, M. D., Grand Rapids.
The Causes and Prevention of Consumption, by William E. Ziegenfuss, M. D., Alpena.

CENTREVILLE SANITARY CONVENTION, JAN. 15 AND 16, 1891.

At the Sanitary Convention at Centreville the following program was carried out:—

Address of Welcome, by Alonzo Palmer, Vice-President of the village.

Response and Statement of the Objects of the Convention, by Henry B. Baker, M. D., Secretary, State Board of Health.

President's Address, by Rev. A. Paige Peeke.

Restriction and Prevention of the Dangerous Communicable Diseases, From the standpoint of a Lawyer, by William Sadler.

Restriction and Prevention of the Dangerous Communicable Diseases, From the standpoint of an Undertaker, by Frank S. Cummings.

The Restriction and Prevention of Dangerous Diseases, by Henry B. Baker, M. D., Secretary, State Board of Health.

The Relation of Privies and Cess-Pools to Wells, Discussion by Edwin Stewart, Mendon.

The Relations of Privies and Cess-Pools to Wells, by William Sadler.

The Water-Supply of Centreville, by L. H. D. Pierce, M. D.

The Germ Diseases, by Henry B. Baker, M. D.

Ventilation of Schools and Public Buildings, by J. F. Brown.

Closing of the Convention.

NILES SANITARY CONVENTION, FEB. 5 AND 6, 1891.

At the Niles Sanitary Convention the following program was carried out:—

President's Address, by Hon. W. I. Babcock.

Response and Statement of the Objects of the Convention, by Hon. John Avery, M. D., of Greenville.

The Water Supply of Cities, by Victor C. Vaughan, M. D., Ann Arbor.

Remarks, by J. H. Kellogg, M. D., Battle Creek.

The Hygiene of Schools, by Prof. J. D. Schiller.

The Restriction and Prevention of Diseases,—from the stand-point of a lawyer,—by Edward Bacon, Attorney.

The Restriction and Prevention of the Dangerous Communicable Diseases,—from the stand-point of a Physician,—by F. R. Belknap, M. D.

Relations of Privies and Cesspools to Wells, by W. I. Tyler, M. D.

The Duties and Compensation of the Health Officer,—from the stand-point of the health officer,—by O. P. Horn, M. D.

Prevention of Diseases of the Eye and Ear, by F. N. Bonine, M. D.

The Care of Children during Hot Weather, by J. S. Pardee, M. D.

The Water Supply of Niles, by J. H. Richardson, M. D.

The Water Supply of Niles—Discussion by Prof. Delos Fall, Albion.

Can Consumption be Prevented? by Simeon Belknap, M. D.

Ventilation and Heating, by W. G. Blish.

Disposal of Waste and Excreta in Niles, by J. D. Greenamyer, M. D.

Sewerage and House-Drainage in Niles, by Daniel Sheehan.

EXAMINATION OF PLANS FOR PROPOSED NEW PUBLIC BUILDINGS, SEWERAGE, VENTILATION, OR HEATING, FOR STATE INSTITUTIONS.

During the fiscal year ending June 30, 1891, no plans were submitted to the State Board of Health for examination, under the law,—Section 7, of Act 86, Laws of 1889, therefore, no report of an examination appears in this Annual Report.

REGULAR AND SPECIAL MEETINGS OF THE STATE BOARD OF HEALTH, DURING THE FISCAL YEAR ENDING JUNE 30, 1891.

SPECIAL MEETING, STATE BOARD OF HEALTH, ALPENA, JULY 11, 1891.

In the absence of the president, the Board was called to order by the vice-president.

The members present were: Henry F. Lyster, M. D., Vice President, Detroit; Prof. Delos Fall, M. S., Albion and Henry B. Baker, M. D., Secretary. John H. Kellogg, M. D., Battle Creek, whose presence was expected not having arrived, State Board of Health vouchers Nos. 1906–1916, inclusive, were allowed subject to his concurrence with the action of the other members of the Board.

[The vouchers allowed at the Alpena meeting were sent to Dr. Kellogg, and his approval of them will be found in a letter from him, dated July 16, 1890.]

This special meeting at Alpena July 11, 1890, took the place of the regular meeting which was to have been held the second Tuesday in July.

SPECIAL MEETING, STATE BOARD OF HEALTH, CHARLEVOIX, AUGUST 14, 1890.

The meeting was called to order by President Avery. The members present were: Hon. John Avery, M. D., President, Greenville; Arthur Hazlewood, M. D., Grand Rapids; John H. Kellogg, M. D., Battle Creek; Victor C. Vaughan, M. D., Ann Arbor; and Henry B. Baker, M. D., Secretary, Lansing.

State Board of Health Vouchers Nos. 1917–1937, inclusive, were allowed at this meeting.

REGULAR MEETING AT LANSING, OCTOBER 14, 1890.

The regular meeting of the Michigan State Board of Health was held in the State Capitol in Lansing, October 14, 1890. The members present were as follows: Arthur Hazlewood, M. D., Prof. V. C. Vaughan, M. D., Prof. Delos Fall, M. S., and Henry B. Baker, M. D., Secretary.

The regular routine business, such as the examination and auditing of bill and accounts was first transacted.

Protection of the School Population from Consumption.

At previous meetings, the State Board of Health has had before it the subject of the best methods for the restriction and prevention of consumption; and, a few years ago, published its opinion that all sputa from consumptive persons should be disinfected. The subject has also been publicly discussed, by the Secretary of the Board and others, at several Sanitary Conventions held under the auspices of the State Board of Health, including the one at Pontiac, referred to below.

Just previous to this meeting of the Board, a letter from a valued correspondent of the Board was presented to members of the Board, as follows:—

MILFORD, MICH., Sept. 29, 1890.

Dr. H. B. Baker, Secy. State Board of Health:

DEAR SIR—There have been several deaths from pulmonary consumption among the pupils who have attended our school during the past two years, and as I feared our building might be infected or unsafe—

I had it thoroughly disinfected with bichloride of mercury. There is now in attendance a pupil from a family where there have been several fatal cases of phthisis. I circulated the Reports of the Pontiac Sanitary Convention sent me, and several of the pupils are afraid to attend in the room along with the pupil who is coughing and is suspected to have consumption. Can our school board *exclude* cases of consumption from school as we do cases of scarlet fever, diphtheria, etc.? I am quite sure there are other school-houses in our county that are unsafe, also churches and other public halls. Would it not be well for the State Board of Health to issue a circular to school boards and others having charge of churches and public buildings, showing the necessity for thorough disinfection and giving a *formula* and method for thorough (annual or semi-annual) disinfection?

Is phthisis officially considered to be communicable?

Respectfully,
ROBT. JOHNSTON.

Although, by leading medical and sanitary authorities, consumption is now quite generally believed to be a "communicable" disease, and it is known to be one of the most dangerous, yet the State Board of Health has not officially declared the opinion that it is a "disease dangerous to the public health," as the term is in the Michigan laws, perhaps for the reason that under existing laws the health officers throughout the State are generally required, under penalties, to "give public notice of infected places, by placard on the premises," to order the "prompt and thorough isolation of those sick" with such a disease, and to do other acts which are important relative to certain other diseases which endanger the public health, but which are not yet believed by sanitarians to be judicious to attempt relative to consumption. A pamphlet is in preparation, designed to state precisely what this Board deems to be the best methods for the restriction of consumption. However, the subject of the protection of the school population from consumption is so important that the Board considered it at this meeting, in advance of the more complete document, and adopted the preambles, resolution, and statement relative to disinfection and destruction of sputa of consumptives, as follows:—

Coughing Consumptives Should be Excluded from Schools.

WHEREAS, The indoor confinement and the severe competitive work of the schoolroom tend to render recovery of health by consumptive pupils impossible; and

WHEREAS, Except consumptives exercise great care with their sputa, and except the ventilation is such as to cause all dust to pass out of the room near the floor level, the presence of consumptives in the school room may endanger the health and lives of their fellow pupils.

Resolved, That, in the opinion of this Board, any pupil or person known to be affected with pulmonary consumption should be excluded from all public schools, colleges, and other institutions of learning until such pupil or person is so far recovered from consumption that no cough or expectoration occurs.

All Sputa of Consumptives Should be Destroyed or Disinfected.

As a measure for the restriction of the spread of consumption, this Board recommends the destruction or disinfection of all sputa of consumptives.

This can be done if each consumptive provides himself with pieces of soft, tough paper that has been paraffined or otherwise made waterproof, each piece to be used but once, its ends immediately so twisted as to allow no escape of the sputa, and then enveloped in another similar paper, similarly twisted, and all burned at the first opportunity.

The importance of protecting young people from consumption seems not to be generally sufficiently understood. Consumption causes more deaths in Michigan than does any other disease. A considerable portion of the deaths are of young persons. Thus, in 1884, no less than 20 per cent of all the deaths reported from consumption in Michigan were of persons under twenty years of age (as many as thirty-five per cent were under twenty-five years of age.) Including teachers (some of whom, however, are over twenty years of age), the population in colleges and other institutions of learning, a large portion of the inhabitants of Michigan, under the age of twenty years are in school. According to the census of 1884, about 37 per cent of the inhabitants attended school during the year. According to the Report of the Superintendent of Public Instruction, for the year 1889, the number of pupils and teachers, in that year, was over 480,000, about 17,000 being teachers.

Consumption may come to the school population in other ways than by school attendance, yet, with no effort at restriction, other things being equal, the greater the number of persons in an assembly the greater the chance of there being a person present infected with, and capable of spreading, the disease. Consumption is now believed to be most generally spread by the inhalation of dust from the dried sputa of consumptive persons. And, while it may not yet be considered judicious to completely isolate all consumptives, it does seem judicious to protect all large assemblies of persons susceptible to consumption. Unless local boards of health make extraordinary provision therefor,* there are, as yet, no special guardians of assemblies in churches, opera houses, theatres, etc.; but it seems to be practicable for school officers, on the ground of public policy, to regulate the attendance in schools, and to exclude therefrom persons suffering from dangerous communicable diseases. If a school board cannot legally do this on its own responsibility, it would seem that the law might well be so amended that it can; but under present laws, it should be able to enforce the orders of the local board of health, respecting persons whom the board of health shall decide to be suffering from a dangerous communicable disease. It therefore seems to be practicable to take such action as shall probably result in a very considerable saving of human life, and among a class of inhabitants especially worth saving.

The attention of school officers throughout the State is especially called to this subject.

The public-health interests of the State will also gain greatly if the modes of spread of the most dangerous communicable diseases shall come to be well known to the school population of the State. The office of the Secretary of the State Board of Health holds itself in readiness, at all times, to do what it can to aid school officers and teachers toward the accomplishment of that very desirable object.

Typhoid Fever Supposed to have been Caused by Water or Milk.

Preliminary Report.

A valued correspondent of this Board wrote, Sept. 28, that typhoid fever had been unusually prevalent in his vicinity this Autumn; cases had occurred among persons using the water from wells, and among those using water from the river, and such a number had occurred among users of milk from one particular cow that the question had arisen whether the disease was all spread by the milk, or whether one or both sources of water were to be charged with its causation.

Samples of the milk, of the river water, and of the well water were sent to Prof. Vaughan, Director of the Laboratory of Hygiene, Ann Arbor, and at this meeting he made a verbal preliminary report that bacteriological examination revealed the fact that both of the samples of water and the milk contained micro-organisms which, by their life processes, in nutritive solutions, form poisons.

THE PRESENT COMPARATIVE IMMUNITY OF ADULTS FROM DIPHTHERIA.

(The Beginning of a Statistical Study.)

Dr. Baker presented a table and an illustrative diagram exhibiting the epidemic-waves of diphtheria in England during the period 1855–1888, inclusive. The part representing the period, 1855–1881, was published in the Proceedings of the Sanitary Convention held at Reed City in April, 1883; but Dr. Baker has now extended the statistics and the diagram to 1888, and has associated with it evidence as to the change which has taken place in the age of decedents from diphtheria in England.

Notwithstanding the belief among statisticians that in the mortality statistics in England, diphtheria was first separated from scarlet fever in 1855, Dr. Baker expressed the view, based upon his examination of the evidence, that it seemed to him probable that diphtheria first reached, and commenced to spread through, England in 1855,—that previous to 1855 there was very little if any real diphtheria which could have been separated from scarlet fever. Dr. Hazlewood, president *pro tem.* of the State Board of Health at this meeting, and who in early life was a medical student in England, expressed a similar view.

Diphtheria reached its maximum prevalence in England in 1859, in which year over 10,000 deaths from it were reported. Among the decedents from diphtheria in England in 1859 was there a larger proportion of adult persons than there has been since that time? Examination of the statistics seems to prove that there was: The proportion of decedents over ten years of age has been gradually decreasing since 1859, in England, and, conversely, the proportion of the decedents that are under ten years of age has been correspondingly increasing. The proportions in decedents in each of specified years (taken somewhat at random) are shown in Table 2, above.

If it is true that diphtheria first gained a permanent existence in England in 1855; and if once having diphtheria confers comparative immunity from the disease, then diphtheria should have caused a greater mortality when it first spread through England than it ever did afterwards. Table 1, and especially the diagram shows that this is the fact,—that there were more deaths from diphtheria in England in 1859 than there has been in any year since, notwithstanding a considerable increase in the population.*

That there shall be gained a knowledge of *the reason why* adults now have comparative immunity from diphtheria is important for several reasons: If the immunity is gained only or chiefly through having the disease, then, if through isolation of cases, and thorough disinfection, the disease shall be generally greatly lessened, †there will gradually be a lessening of the proportion of adults who are comparatively immune, that is to say there will be a correspondingly large proportion of adults who may have fatal diphtheria whenever the disease does come to them; and instead of the disease being, as it now is, a disease fatal chiefly to children it would become fatal also to adults.

On the other hand, if the comparative immunity of adults is due to their power for resisting the disease being greater than it is among children, through influences incident to age alone (such, for instance, as tougher skin and mucous membrane of throat), then the practical sanitarians have a more simple task before them.

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*It is proper to state that, although this is true for England as a whole, in the city of London by itself there was a slightly greater reported *death-rate* from diphtheria in 1888 than in 1859.

†There is good evidence that this is now being done in Michigan.

TABLE 1. *Epidemic Waves.—Deaths from Diphtheria in England and in Michigan for Years stated.*

PLACES.	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871
England:																	
No. of deaths	885	608	1588	6606	10184	5212	4517	4903	6507	5464	4145	3000	2600	3013	2606	2699	2525
Deaths per Million Inhabitants*.	20	32	82	339	517	261	225	241	315	261	196	140	120	187	117	120	111
Michigan....	----	----	----	----	----	----	----	----	----	----	----	----	110	72	89	121	121

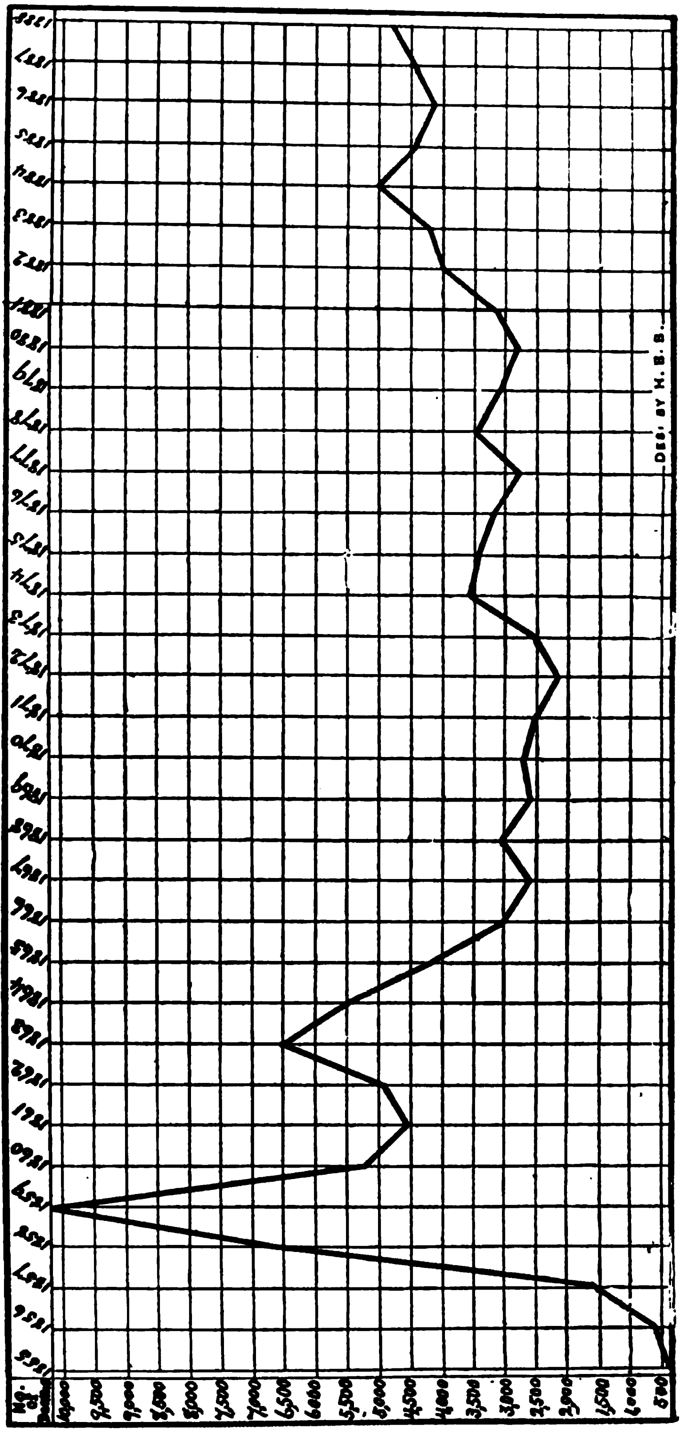
PLACES.	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888
England:																	
No. of deaths	2152	2561	3560	3415	3151	2731	3498	3033	2310	3153	3992	4218	5020	4471	4098	4448	4815
Deaths per Million Inhabitants*.	98	108	150	142	129	111	140	120	109	121	151	158	185	163	147	157	168
Michigan....	192	217	218	207	311	598	887	1473	1542	2063	1416	1007	1065	1054	1117	935	717

⌒ Crest of wave,—a year of maximum mortality from diphtheria.

* Fiftieth Annual Report, Registrar General of England, 1887, page lviii.

Dr. Baker had noticed instances in which immunity from diphtheria seemed to have been conferred upon persons by their having had the disease; one notable instance being as follows:—a family of seven or eight persons were exposed to diphtheria, through one of them acting as nursery maid in a family in which the disease was, which being near by, more or less communication with her home occurred; also by the washing of the family, in which the diphtheria was, being done by the woman of the house in the first-mentioned family. The result was that every member of the exposed family had diphtheria (in the comparatively mild form in which adults usually have it) except one person who had had diphtheria the preceding year.

Having this in mind, the question arose whether it is possible to get, from the statistics of mortality from diphtheria, evidence on the subject of immunity from diphtheria among those who have had the disease. Is the fact that diphtheria is usually not fatal to adults, to be explained (altogether or in part) by their having had the disease once in early life? If this hypothesis is the true explanation, then when diphtheria first reaches a country there should be a much larger proportion of adults among the decedents than there is afterwards; because at first the adults would not be protected through having had the disease, while afterwards, if the disease becomes general and permanent, many of the adults would be thus protected, in case immunity is thus obtained.



EPIDEMIC WAVES—DEATHS FROM DIPHTHERIA IN ENGLAND, YEARS 1855-88.

TABLE 2.—*Deaths from Diphtheria in England.*

Years.	Diphtheria Decedents.		Deaths from Diphtheria per Million inhabitants.*
	Per Cent Under 10 Years of Age.	Per Cent Over 10 Years of Age.	
1857	† 85.48	† 14.52	82
1859	79.22	20.78	517
1860	79.82	20.18	261
1861	79.37	20.63	225
1868	82.60	17.40	187
1869	81.77	18.23	117
1870	80.77	19.23	120
1871	81.59	18.41	111
1872	81.18	18.82	93
1873	83.21	16.79	108
1874	80.67	19.33	150
1875	80.81	19.19	142
1876	82.70	17.30	129
1877	82.52	17.48	111
1878	83.28	16.72	140
1879	82.44	17.56	120
1880	83.47	16.53	109
1882	84.97	15.03	151
1883	84.57	15.43	158
1884	84.06	15.94	185
1885	83.74	16.26	163
1886	84.82	15.18	147
1887	86.41	13.59	157
1888	87.16	12.84	168

* Fiftieth Annual Report, Registrar-General of England, 1887, page lviii.

† For the year 1857 only 310 deaths of persons at all ages were included in the table, therefore these figures may not supply very reliable evidence on this point, for that year; but if the evidence is good there is a possible explanation further on.

Some of the facts developed by this study of the statistics of England and of Michigan are more in accord with the last mentioned hypothesis than with the idea that the immunity is due chiefly to having had the disease. For instance, it seems that in the very first year (1857) for which the computation could be made in England, the per cent of decedents aged under ten years was 85.48, which is about the average of late years. This is shown in the first line in Table 2.

Then in the table (No. 3) for Michigan, it is seen that there was not from the first a gradual decrease of proportion of adults among the dece-

TABLE 3.—*Deaths from Diphtheria in Michigan, for each of the twenty-one Years 1868-1888; Per Cent of Decedents Under Ten Years of Age; Per Cent of Decedents Over Ten Years of Age; Number of Deaths at all Ages; Estimated Population; and Reported Deaths per one thousand Inhabitants. Average for the years 1868-77, 1887-88, when the death rate was more than five-tenths of one death per thousand inhabitants; average for the years 1878-86, when the death-rate was less than five-tenths of one death; and, average for the whole series of years 1868-88.*

Year.	Diphtheria Decedents.		Total Deaths from Diphtheria at all Ages.	Estimated Population, in June of each Year.*	Reported Deaths from Diphtheria per 1,000 Inhabitants.
	Per cent Under 10 years of Age.	Per cent Over 10 years of Age.			
1868	† 75.00	25.00	72	1,080,906	.07
1869	79.78	20.22	89	1,131,600	.08
1870	83.47	16.53	121	‡ 1,184,282	.10
1871	82.64	17.36	121	1,223,176	.10
1872	80.21	19.79	192	1,263,352	.15
1873	84.79	15.21	217	1,304,842	.17
1874	85.45	14.55	213	1,347,678	.16
1875	81.64	18.36	207	1,391,927	.15
1876	78.14	21.86	311	1,437,621	.22
1877	77.91	22.09	593	1,484,824	.40
1878	76.10	23.90	887	1,533,573	.58
1879	77.12	22.88	1,473	1,583,932	.93
1880	78.15	21.85	1,542	‡ 1,636,937	.94
1881	74.80	25.20	2,063	1,677,346	1.23
1882	76.55	23.45	1,416	1,718,761	.82
1883	80.24	19.76	1,007	1,761,202	.57
1884	80.47	19.53	1,065	§ 1,804,699	.59
1885	77.99	22.01	1,054	1,849,258	.57
1886	75.65	24.35	1,117	1,891,928	.59
1887	78.82	21.18	935	1,941,710	.48
1888	80.89	19.11	717	1,989,653	.36
1889				2,038,784	
1890				‡ 2,089,792	
1868-77, 1887-88	80.73	19.27			.20
1878-86	77.45	22.55			.75
1868-88 (Av. for whole series)	79.32	20.68			.44

* The statements of the estimated population for the years 1868 and 1869 were taken from the "Introduction" to the "Statistics of Michigan 1870," page lxxx; those for the years 1870, 1880, and 1890 were of the exact numbers of inhabitants as enumerated for the U. S. censuses; for the remaining years, they were estimated by taking the figures of the U. S. censuses of 1870, 1880, and 1890 and computing for each decennial period, the annual increase per 1,000 inhabitants. From 1870 to 1880 this was, approximately, 32.85; and from 1880 to 1890 it was about 24.7. The figures in Michigan censuses in 1864, 1874, and 1884 were not used for the purpose of this estimation, nor in this table for the census years, because the State censuses for 1864 and 1874 were taken at a different time of the year from that of the U. S. censuses, and, although the State census for 1884 showed a greater population than the estimate based on the preceding and succeeding U. S. censuses, the State census figures could not be used because not comparable with those for the other years estimated from the annual increase per 1,000 inhabitants according to the U. S. census.

† For the last nine (9) months of the year 1868.

‡ According to the U. S. census.

§ The population of Michigan in June, 1884, according to the State census, was 1,853,658.

dents from diphtheria, but the table shows that generally in those years when the deaths were most numerous there was the greatest proportion of adult decedents.[*] This might be the case if we suppose that the increase in the mortality from diphtheria in those years was due not altogether to an increased number of susceptible persons among the inhabitants, but also to greater intensity of the diphtheritic virus in those years, or to a greater intensity of meteorological conditions favoring the disease.

The meteorological conditions favoring the disease in any given year are well shown in tables and diagrams in various articles prepared by myself, and published by this State Board of Health; speaking generally, the evidence is conclusive that diphtheria rises after the cold months, and falls after the warm months; but this study has not yet been extended so as to show whether the same general law holds true by years as it does by months.

NONE BUT WELL-QUALIFIED PHYSICIANS.

Proposed Legal Organization of the Entire Medical Profession of the State.

At this meeting of the Board, the subject of an attempt to stop the continued influx of unqualified practitioners was brought up, through a communication to the Secretary of the Board, from George Duffield, M. D., Secretary of a committee of the State Medical Society, whereupon the following preamble and resolutions were adopted.

WHEREAS, It is agreed by all classes of people that the public health would be much better protected if none but properly-qualified persons were permitted to practice medicine, and thus to have in their keeping measures relative to life and death.

Resolved, That it is believed to be practicable, through judicious legislation, to so organize the present legal medical practitioners in Michigan, as that through representatives, elected by themselves, they shall guard the entrance to the profession, by a preliminary examination of students, and a final examination of graduates of colleges and of proposed practitioners who come from other States, so that the entire medical profession of this State shall be united in the effort to improve the qualifications of its new members.

Resolved, That the Secretary of this Board be directed to transmit a copy of the foregoing preamble and resolution to the chairman of the committees on public health in the Senate and House of Representatives in the State Legislature, as soon as it is in session.

REGULAR MEETING OF THE STATE BOARD OF HEALTH, LANSING, JANUARY 13, 1891.

The meeting was called to order by the President at 9:45 A. M., the roll was called, and the following named members, sufficient to form a quorum, were present: John Avery, M. D., President, Greenville; John H. Kellogg, M. D., Battle Creek; Arthur Hazlewood, M. D., Grand Rapids; Victor C. Vaughan, M. D., Ann Arbor; Prof. Delos Fall, M. S., Albion; and Henry B. Baker, M. D., Secretary, Lansing.

The Secretary having been excused from reading the minutes of the preceding meeting, presented his report of work in the Office of the Board, during the quarter ending December 31, 1890.

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[*] As may be seen by the last three lines in Table 8, relative to diphtheria in Michigan, when the reported deaths from diphtheria are *over* five-tenths of one death per thousand inhabitants, the average per cent of diphtheria decedents over ten years of age is 22.55, and when the reported deaths from diphtheria are *less* than five-tenths of one death per thousand inhabitants, the average per cent of diphtheria decedents over ten years of age is 19.27. (The average per cent of diphtheria decedents aged over ten years is 20.68.)

On motion of the Secretary, Voucher No. 1958, for $100 allowed at the regular meeting of the Board, October 14, 1890, for postage for use of the Office of the Board, was canceled.

State Board of Health Vouchers Nos. 1962–2007, inclusive, were allowed.

It was voted that Prof. Fall's paper, on the Study of the Action of Alcohol on the Human Body, should be printed in the Annual Report of the Board.

The Secretary presented and read the following letter:—

> CITY OF GLASGOW, Belvidere Fever Hospital, Dec. 20, 1890.
>
> *Dr. Henry B. Baker, Secy. Michigan Board of Health.*
>
> DEAR SIR:—Many thanks for your valuable letters on disinfection, and the pamphlets which accompanied them. We are just completing a fine new wash-house in connection with the Fever Hospital and the question of *disinfection* has come up for re-consideration. Hitherto we have employed sulphur fumes, and I should like this method to be continued for I agree with you in believing in the efficiency of sulphur as a disinfectant. I shall have your letter on my side. I posted some pamphlets connected with the Belvidere Hospital which may possibly have some interest for you. If you should visit Glasgow, I shall be very much pleased to show you over this institution.
>
> Again thanking you for your courteous attention.
>
> Very sincerely,
>
> JAMES W. ALLAN.

The President and a committee of the State Association of Funeral Directors, came before the State Board of Health, for conference relative to taking action for lessening the number of incompetent persons who have to do with the bodies of the dead.

On motion of the Secretary, the order of business was suspended, to receive the committee from the State Undertakers' Association. Mr. Buck, President, spoke briefly, and read a proposed bill. Mr. Benjamin, of the undertakers, spoke asking advice of this Board. Dr. Vaughan spoke relative to the action of the State Medical Society, looking to a plan of *regulating* the practice of embalming—not to *prevent* embalming, as had been suggested. (Dr. Vaughan was chairman of the committee of the State Medical Society.) Doctor Vaughan's propositions were: (1) No person should embalm except the person has a license. (2) No dead body should be embalmed without a certificate of cause of death from attending physician, to be kept by the funeral director. (Cases of alleged murder in Michigan have been complicated by the alleged embalming.) (3) No embalming fluid should be used the composition of which is not known, and placed on record. The Funeral Directors, the State Medical Society, and the State Board of Health, might each have a committee to formulate and agree upon a bill. Dr. Vaughan suggested that the purpose of the bill might well be restricted to providing for qualified persons to do embalming—a bill "to regulate embalming."

Dr. Kellogg moved that a committee from the State Board of Health be appointed to confer with a committee from the State Medical Society, and with the committee from the State Association of Funeral Directors.

The motion was carried, and Drs. Kellogg and Baker were appointed as that committee.

In reference to the Governor's recommendations in regard to the State Board of Health, Dr. Vaughan proposed that the Board should send to the Governor and the legislature a statement of the work of the Board. He moved that the Secretary be instructed to prepare a statement of the work done by this Board, and of the sickness and deaths prevented by this work. Dr. Kellogg moved that Dr. Vaughan be appointed a member of the committee to prepare said statement. Dr. Vaughan thought that each member of the Board should consider himself a member of this committee; but the Secretary should first prepare and send to each member a proposed statement. Dr. Vaughan's motion prevailed.

Rules for the transportation of Dead Bodies, received from the General Passenger Agent of the Canadian Pacific Railroad, were presented by the Secretary for consideration of the Board. Dr. Baker moved that, as these rules are similar to those already approved by this Board, they also be approved. Which motion prevailed.

Dr. Baker stated that the pamphlet on the Prevention and Restriction of Typhoid Fever is nearly out of print. He moved that it be reprinted.

Dr. Kellogg suggested that it be modified so as not to say that typhoid fever is *most frequently* communicated through the water.

Dr. Vaughan said the typhoid germ is perhaps nothing more than a form of the Bacterium termo, the ordinary micro-organism of putrefaction. Drs. Vaughan and Kellogg both said that typhoid fever is sometimes carried through the air.

The pamphlet was amended, in several particulars, as marked on the one in the hands of the Secretary.

It was then moved and voted that ten thousand copies of the amended pamphlet be printed.

Dr. Baker moved that the pamphlet on the Restriction of Measles be reprinted. The Secretary was directed to revise it, and then to print a sufficient number of copies.

On motion of Dr. Vaughan, Dr. Baker's paper on Consumption, read at Denver, Col., was directed to be printed in the Annual Report.

The Secretary read the following extract from a letter from Hon. LeRoy Parker, relative to books loaned to that gentleman from the library of the Board, and which had not been returned: "I have no recollection of seeing them for many years and they must either have been returned or lost by me, I don't know which. If you can get duplicates of the 'Ordinance' and 'Sanitary Charts' please do so, and I will pay for them. At all events strike my name off the books as delinquent." The Secretary asked what he should do in such cases. Dr. Hazlewood moved that, in such cases the Secretary be empowered to use his judgment as regards enforcing payment for books not returned. The motion prevailed.

The Secretary presented a letter, received from Dr. Wm. G. Saunders, health officer of Grand Rapids, in which Dr. Saunders wrote: "I believe there should be a law giving jurisdiction to local boards of health in cities of 20,000, or more, over one mile outside the city limits, in cases of small-pox or other contagious cases. This they should have for the protection of the city."

The Secretary asked what reply he should give to Dr. Saunders' letter.

The Board thought it not advisable to have such a law as that proposed by Dr. Saunders, because it would interfere with local self government in the vicinity of cities.

Dr. Kellogg having been asked to report on "Heating and Ventilation," read a report, giving general principles, formula, and methods for planning the ventilation of buildings. It was a report brought about through requests by the superintendents of public buildings, architects, and others who desire to know what plans for public buildings would be likely to be approved by the State Board of Health, (the law now requires the State Board of Health to examine and give opinion on plans for public buildings).

This report was ordered to be printed in the Annual Report of this Board.

Dr. Kellogg presented, and gave outline of a report on the respiration of persons in relation to dress; pointing out that the breathing is greatly modified by dress. He presented pneumographic tracings of the breathing of persons differently dressed; showing that dress changes the type of respiration. His tracings are of persons of different nationalities, of both sexes, also of animals in normal condition and dressed or laced. His examinations show many displacements of internal organs consequent upon improper modes of dress-corsets, tight lacing. He has found deformities resulting from modes of dress. An apparatus, designed by him, enables one readily to take outline drawings of bodies of persons; and these tracings have been applied to civilized women in America, France and elsewhere, Chinese women, Indian squaws, and other persons, and comparative statements are given in this report.

On motion of Dr. Vaughan, the report was accepted, and was ordered printed in the Annual Report of the Board.

The Secretary presented letters from Dr. Joseph Marshall of Gaines, Michigan, relative to boards of health paying physicians for loss from giving up practice while treating cases of dangerous communicable diseases for the local board of health.

The Secretary mentioned a letter from Dr. Christian of Wyandotte, asking that the Detroit river water be analyzed; also a letter from Prof. Vaughan, suggesting that it be postponed until next summer. .

On motion, the Board adjourned.

SPECIAL MEETING OF THE STATE BOARD OF HEALTH, NILES, FEBRUARY 5, 1891.

The meeting was called to order by the President, at 10 P. M. The following named members, sufficient to form a quorum, were present: John Avery, M. D., President, Greenville; J. H. Kellogg, M. D., Battle Creek; Victor C. Vaughan, M. D., Ann Arbor; Henry B. Baker, M. D., Secretary, Lansing.

State Board of Health vouchers Nos. 1992–2001, inclusive, were allowed.

A proposed circular, for the restriction of small-pox, by vaccination, was presented for consideration of the Board, by the Secretary, and was approved.

The Secretary presented a copy of a letter received from Chas. E. Begel, M. D., of Holloway, Health Officer of Raisin Township, Lenawee Co., relative to a railroad crossing which he believed to endanger human life in his jurisdiction. Dr. Avery suggested that the railroad should go either over or under the highway; and told of a similar crossing, at Greenville, where a number of persons had been killed. Dr. Kellogg spoke of a loss of human lives at a similar crossing in Battle Creek, Michigan.

On motion of Dr. Vaughan, the Secretary was appointed a committee to confer with the State Railroad Commissioner in regard to the dangerous railroad crossing in Raisin township.

The Secretary presented a proposed bill, received from Hon. Jacob Den Herder, of Holland, for the consideration of the Board. Dr. Avery suggested an amendment to said bill. Dr. Kellogg thought that the bill had better be submitted to Parke, Davis & Co., for their perusal. Dr. Vaughan thought that there were about twenty so-called "opium cures" two or three of which were made in Michigan, and suggested that a bill be submitted to the present legislature, making it a criminal offense for any person, except on the prescription of a physician, to sell "a mixture containing any opium or other narcotic;" also that there be plainly printed on the label of each compound, the names and proportions of the ingredients of which such compound is composed.

The Secretary was instructed to inform Mr. DenHerder that the Board approved of this proposed "bill."

Dr. Baker proposed the preparation and presentation to the present legislature of two bills: (1.) Making it a criminal offense for any person having a dangerous communicable disease, to knowingly and willfully expose others to such dangerous communicable disease. (2.) A bill to prevent the introduction of dangerous communicable diseases into any locality.

Dr. Kellogg thought, that the four bills presented to the legislature in 1888–9 and not passed, should be brought to the notice of the present legislature; namely: two relative to milk, one relative to gasoline, and one relative to food adulteration.

Dr. Avery proposed that the Board ask the Michigan legislature for an appropriation of $5,000 to be used in scientific investigations in the State Laboratory of Hygiene, at Ann Arbor, under the supervision of the State Board of Health. This motion was supported by Dr. Kellogg; Dr. Vaughan thought the amount asked for should be $3,000 instead of $5,000; Dr. Baker suggested an amendment so as to read $4,000, which was finally informally adopted by the Board.

The Board adjourned at 12:15 midnight.

REGULAR AND ANNUAL MEETING, STATE BOARD OF HEALTH
LANSING, APRIL 14, 1891.

For this meeting notice was sent to each member of the Board by the Secretary, as follows:

April 6, 1891.

Member of the State Board of Health:

Dear Doctor:—The time for the regular quarterly meeting of this State Board of Health is Tuesday, April 14, at nine o'clock A. M., at the Capitol, Lansing.

Doctors Lyster and Kellogg are still members of this Board; and, according to decision by the Attorney General, they will be until their successors are appointed and have qualified. If there is any new member before the time of the meeting, I will notify the one who is displaced.

It seems desirable that there be a full Board in attendance.

If any member cannot be present, it is hoped he will notify the Secretary.

Very respectfully,

Henry B. Baker, ***Secretary.***

The annual meeting of the Michigan State Board of Health was held in the State Capitol in Lansing, April 14, 1891. The members present were as follows: John Avery, M. D., Arthur Hazlewood, M. D., Prof. Delos Fall, M. S., and Henry B. Baker, M. D., Secretary. Prof. V. C. Vaughan, M. D., was present at the afternoon session.

The regular routine business, such as the reading, correction and approval of minutes, the examination and auditing of bills and accounts, was first transacted.

The annual address by the President being in order, Hon. John Avery, M. D., Greenville, President of the State Board of Health, made the following remarks:—

"I do not know that I have anything of special interest to say to the members of the Board at this meeting. I have said about all that I have had so say, at the different meetings of the Board, at the sanitary conventions held in various parts of the State, and to the public through the press. I did not feel that it would be necessary to make any special address at this meeting. I wish to thank the members of the Board for the kindness and courtesy which they have shown me during the four years that I have presided over their deliberations."

The election of President was the next thing in order, but was deferred until other members of the Board should arrive, being made the special order for 2 P. M. At that hour, Dr. Avery was unanimously elected President of the Board for the ensuing two years.

Dr. Hazlewood presented the subject of the labeling of so-called patent medicines. He thought it would be a benefit to the public if the legislature would take action on the subject; that, if all such medicines were required to be correctly labeled, it would tend to prevent mistakes, and to do away with many of the so-called opium cures, cures for inebriety, etc., all of which do harm.

Dr. Hazlewood also suggested that canned fruits, meats and vegetables should have the date when they were put up plainly printed or stamped upon the can or label. This would enable the purchaser to tell how long the food had been in the can, and whether it was likely to be spoiled, and perhaps poisonous.

A motion was made to appoint Dr. Hazlewood a committee of one to confer with members of the legislature who have introdued bills on the subject of foods; but Dr. Hazlewood said that was not necessary, he would endeavor to confer with them on the subject.

The Secretary presented his quarterly report of work in the office. It is printed further on in this Report.

THE AFTERNOON SESSION, APRIL 14, 1891.

Disinfection after contagious diseases.

The great need for, and how to get more thorough disinfection of premises after the occurrence of dangerous communicable diseases, was a subject discussed by Dr. Hazlewood, member of the Board, from Grand Rapids. He was followed, on the same subject, by the Secretary of the Board, who presented a letter from Dr. A. W. Nicholson of Newberry, Michigan, asking the question, relative to dangerous communicable diseases in Michigan, "Is the matter of making a final report and a final disinfection emphasized enough?"

Dr. Nicholson says a number of instances have come to his notice, where an outbreak of a contagious disease has been reported to the State Board of Health, and "where, after the subsidence of the disease, I am sure no disinfection or fumigation was used to destroy remaining germs. Perhaps this is due to failure on the part of health officers, often, to report, finally to you. I have often wondered whether a considerable number of those reporting an outbreak, did not neglect sending in a final report as well as neglect a process of final disinfection."

The Secretary presented a table, bearing on this subject, which shows that, since 1886, final reports were received from the local health officers for less than one-half the total number of alleged outbreaks; that only 40 per cent of those final reports stated that isolation and disinfection had been fully practiced; and, that in only 19 per cent of the total alleged outbreaks is it stated that all infected persons and things had been properly isolated and finally disinfected.

Disinfection after Diphtheria.

TABLE.—*Showing the total number of outbreaks of Diphtheria, in Michigan, which were reported to the Office of the State Board of Health during the four years, 1886–1889; the number of those outbreaks for which final reports were received; and the number of the Final Report received which stated that the restrictive and preventive measures (isolation and disinfection), recommended by the State Board of Health, has been fully practiced.*

YEAR.	Total No. of alleged outbreaks.	No. of outbreaks for which final reports were made.	No. of final reports which stated that restrictive and preventive measures had been fully practiced.	Per cent of all alleged outbreaks for which final reports were made.	Per cent of final reports which stated that restrictive and preventive measures had been fully practiced.	Ratio of outbreaks where preventive and restrictive measures were practiced to the total No. of alleged outbreaks. (Per cent.)
1886	550	239	116	43	49	21
1887	466	205	78	44	38	17
1888	337	165	58	49	35	17
1889	397	210	78	53	37	20
Average	438	205	83	47	40	19

If the legislature would pass the Senate Bill 257 (House Bill 640), granting the small appropriation for the use of the Board, for analyses of waters, foods, etc., and which would also "enable the State Board of Health to have an inspector who, under the direction of the Board, shall investigate outbreaks of dangerous communicable diseases, examining the facts relative to the nature, origin and spread of such diseases, and the best means for their restriction and prevention, and aid localities in their restriction and prevention," the instances of neglect, complained of by Dr. Nicholson, would probably be very greatly lessened, and probably hundreds of lives could be saved in every year. Dr. Baker said: "I wish to emphatically express my belief that if this Senate bill No. 257 becomes a law, and the inspector does what the bill contemplates, in every year hundreds of lives will be saved in Michigan."

"The bill contemplates using part of the appropriation for the analyses of foods, waters, and other substances suspected of being dangerous to the public health. On this subject I wish to refer to the outbreak of typhoid fever in Wyandotte, Michigan, the cutting short of which, through analyses, such as are provided for by this bill, Dr. Christian of Wyandotte, seems to think worth the full amount of the appropriation for the State Board of Health for a year.

"Before the Detroit Academy of Medicine, Dr. E. P. Christian, recently read an account of an outbreak of typhoid fever in Wyandotte in which he had been in doubt whether its cause was in the river water, well water or milk. He had reported it to the State Board of Health, and the Board had employed Prof. Vaughan, Director of the State Laboratory of Hygiene to make chemical and biological tests of the water and milk, with the result that although the river water was found to be not perfectly safe, the well water was worse, and the milk the worst of all. Dr. Christian says: 'With the discontinuance of the infected milk in this epidemic, the fever disappeared from these families (with the one exception of those who had returned to its use) and from the neighborhood, only appearing sporadically and sparsely, as in ordinary seasons. Was not the strangling of such a malignant epidemic (even after it had already destroyed two promising lives), by the aid of the State Board of Health, before it had reached the magnitude and fatality of some recorded epidemics from a similar source, worth all the trifling expense of a year's appropriation for that Board.

'Another practical consideration, which is suggested, is in regard to the duties of health officers, under whose supervision there should be not merely the milk inspection, as now performed, to protect the consumers against adulterations, dilutions and sophistications, but in all cases of infectious disease, and especially in typhoid fevers, a bacteriological examination of the milk being used and the opportunity for this examination should be convenient for all suspected samples.' Dr. Christian says: 'Since writing the foregoing, I have received a copy of the following Bill before the State Senate.' He then gives Senate Bill No. 257, being

'A Bill to make an appropriation for analyses of suspected waters, foods and other substances, and to otherwise increase the efficiency of the State Board of Health in restricting dangerous diseases.

SECTION 1. *The People of the State of Michigan enact*, That in order to enable the State Board of Health to have analyses of waters, foods and other substances suspected of being dangerous to the public health, made at the Laboratory of Hygiene, at the State University, and, also, to enable the State Board of Health to have an inspector who, under the direction of the board, shall investigate outbreaks of dangerous communicable diseases, examining the facts relative to the nature, origin and spread of such diseases, and the best means for their restriction and prevention, and aid localities in their restriction and prevention, the sum of three thousand dollars per annum, or so much thereof as the State Board of Health may deem necessary, is hereby appropriated.'

In the same number of the American Lancet in which Dr. Christian's paper appears,* the editor, in mentioning Senate Bill No. 257, says: "It seems to us that the interests of the entire people demand that a liberal appropriation be made for these purposes."

OUTLINE OF WORK DONE IN THE LABORATORY OF HYGIENE, UNIVERSITY OF MICHIGAN, 1890.

By Prof. Victor C. Vaughan, M. D., Ph. D., Member of the State Board of Health, Director of the Laboratory.

To the Honorable Members of the Michigan State Board of Health, Gentlemen:—In accordance with your request I herewith submit a brief synopsis of the work which has been done in the Laboratory of Hygiene during the past twelve months.

1. *Baking Powders.*—Mr. A. McNeil has made analyses of all the baking powders which could be obtained in the Ann Arbor market in May and June, 1890. These may be grouped into the following classes:

(*a*) Tartrate powders in which cream of tartar or tartaric acid is the active acid principle.

(*b*) Alum powders in which roasted alum supplies the acid.

(*c*) Phosphate powders, in which an acid phosphate furnishes the acid ingredient.

(*d*) Alum-phosphate powders, in which both roasted alum and the acid phosphate are present.

(*e*) Sulphate powders, in which bisulphate of potash is found.

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* The American Lancet, Detroit, Mich., April, 1891, page 127.

The following table gives the relative values of the powders examined:

Name of the baking powder.	Per cent of strength.	Name of the baking powder.	Per cent of strength.
Royal	11.31	Empire	5.79
Deland	11.33	Globe	2.38
Huyser	4.01	Silver King	5.06
Sunshine	4.18	Cook's Favorite	4.62
Werner & Bremmer	4.11	Kenton	4.13
Chicago Yeast	8.54	Corliss	.41
Daisy	6.78	Neptune	.29
Ætna	6.73	Jersey	5.06

2. *New Bacterial Poisons.*—During the year I have isolated and studied six new bacterial poisons, two of these were obtained from germs found in drinking water, three from germs obtained by Dr. Booker, of Baltimore, from the stools of children with summer diarrhea, and one from poisonous cheese. These substances belong to the class of toxic albumins, and a more thorough study of them promises us much light upon the nature and possibly upon the treatment of the diseases with which they are associated.

3. *Examination of Drinking Water.*—We have made complete analyses of 119 samples of drinking water, which have been sent by health officers and others. Many other samples have been submitted to partial examination, either chemical or bacteriological. For these analyses a charge of $10 for each sample is made to residents of Michigan, and $25 to residents of other States. This money is received by the Secretary of the University, and is used to cover the actual expenses of the work. In these studies a number of new poisonous germs have been found.

4. *Hog Cholera.*—Instructor Novy has discovered two new basic poisons and a poisonous albumin in cultures of the bacillus of this disease. He has also obtained immunity in rats against the active germ, by previous treatment with these substances in small doses.

5. *Koch's tuberculin.*—Experiments have been made with this proposed cure for consumption, and as the results have not been satisfactory its employment in University hospital has been discontinued.

6. *The Germs of Cheese.*—Mr. Jones has been engaged in a study of the organisms which cause the ripening of cheese. This work promises to be of service to dairymen, and will be continued.

7. *Chicken Cholera.* -Mr. Greenshields is now employed in an investigation of the chemical poisons produced by this germ.

8. *Modified Germs.*—Mr. Zucher has been studying the effects of the addition of small quantities of corrosive sublimate and carbolic acid to cultures of disease-producing germs, in the hope of so modifying their character that they might be employed in vaccination,—protective inoculation.

In addition to the above original investigations, the teaching force of the laboratory has been engaged in giving instruction, in bacteriology, water analysis, and the detection of adulterations in food, to the students of the University.

I am now preparing a detailed statement of the work outlined above, which I will submit to you for publication in your Annual Report.

Respectfully,
V. C. VAUGHAN,
Director of the Laboratory.

Several topics relating to public-health interests of the people of the State, were then discussed, and orders were given to the Secretary relative to details of work in the office of the State Board of Health, after which the Board adjourned.

HENRY B. BAKER,
Secretary.

THE PROPOSED ABOLITION OF THE STATE BOARD OF HEALTH, REASONS FOR ITS EXISTENCE, WORK ALREADY ACCOMPLISHED, ITS COSTS, AND ITS BENEFITS TO THE PEOPLE.

Under this head there are here included:

1. Memorial of the State Board of Health, to the Governor and Members of the Legislature, relative to the lines of work of the Board.
2. Annual expenditures by and on account of the State Board of Health.
3. Annual expenditures by each of the several State Boards of Health.
4. Letters, petitions and protests against the abolition of the State Board of Health.
5. Organization and functions of the State Board of Health, as stated in the Legislative Manual, 1891.
6. An incident illustrative of the need for constant watchfulness, to prevent the spread of dangerous diseases.
7. Cost and utility of Annual Reports and publications by the State Board of Health.
8. Proposed legislation and laws passed in Michigan in 1891, relating directly or indirectly to the public health and safety.

The following extract from the Daily Legislative Journal (pages 206–9 of the bound volume Senate Journal) contains an interesting statement of some of the reasons for the continued existence of the State Board of Health:

Communications from State Officers.

MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Michigan, February 12, 1891.

To the President of the Senate:

SIR—By direction of the State Board of Health, I transmit to you the accompanying memorial.

Very respectfully,
HENRY B. BAKER, *Secretary.*

The memorial was received and ordered spread on the Journal, as follows:

1.—MEMORIAL FROM THE STATE BOARD OF HEALTH.

To the Honorable, the Governor and Members of the Legislature of the State of Michigan:

GENTLEMEN—The Governor having advised the Legislature to consider the advisability of abolishing the State Board of Health, we, the members of said board, deem it desirable to place before you this concise statement.

Some of the work of the board may be summarized as follows:

1. *The restriction of diseases dangerous to the public health.* The State board attempts to do this work through and by the aid of the local boards of health, of which there are more than 1,500 in the State. To these local boards, the State board acts (1) as an organizer, (2) as an adviser and (3) as a helper.

When the State board was created there were only a few active local boards. By repeatedly calling the attention of city, village and township authorities to the importance of appointing health officers, the State board has favored the complete organization of local boards, and nearly every city, village and township in the State has now a more or less efficient local board. We think that we may say without any self laudation that the present health service of the State has been organized by the State board. Before the creation of the central board cases of diphtheria, scarlet fever, and of other diseases dangerous to the public health, were not reported, houses were not placarded, cases were not isolated, houses were not disinfected, public funerals of those dead from these diseases were held, bodies were sent from one part of the State to another without precaution against the spread of the disease, the number of epidemics and the number of individual cases occurring in each outbreak and the number of deaths were greater than at present. We have statistics, which we shall be glad to have you examine, showing that the annual saving of life from only three diseases, since the organization of the health service, has amounted to 1,100 lives, representing about 7,000 cases of sickness. Estimate each of these lives at only $500, about half the value of an adult slave, and you have the annual saving to the State of $550,000. This is the known saving from three diseases only. Place against this the $15,000 or $20,000, annual cost of maintaining the State Board of Health, as the debit side of the question and you have an incomplete idea of the saving, looked at wholly from the financial standpoint. If the State Board of Health had done nothing more than organize the health service of the State, we submit that it has amply repaid the State for every cent which it has expended.

But it may be argued that the local boards having been organized and now doing fairly efficient work, there is no longer any necessity for continuing the State board. This leads us to consider the ways in which the local boards are helped and advised by the central board. These may be summarized as follows:

(*a.*) By the prompt notification of the possible introduction of infectious diseases. Weekly reports are sent out showing the prevalence of various diseases in different parts of the State. In this way the local boards are sometimes made aware of possible dangers which they are able to prevent.

The state boards of health of the various states and of the provinces of Canada, by mutual agreement, promptly notify other state and provincial boards, by telegraph when necessary, of the appearance of such diseases as small-pox, and this State board notifies the local boards of cities, villages and townships which, on account of their location, are likely to be exposed.

(*b.*) By instruction in the best methods of securing prompt and efficient isolation and disinfection. The methods of isolation and disinfection applicable to the various diseases are different. The State board gets its information upon these points from the investigations and experiences of others and those of its own. This information is furnished to the local authorities by means of printed circulars, also by letters, telegrams and telephone messages in response to direct questions. The local health officer not only uses this information himself, but he leaves the circulars with the affected family, and distributes others among the neighbors. In this way valuable knowledge concerning the means necessary to prevent the spread of infectious diseases, is disseminated among the people at a time when they are most likely to benefit by it. We have facts and figures which will show, beyond any question, that the number of cases and the number of deaths are much less in those outbreaks in which the directions of the State board have been followed than in those in which they have not been observed. We shall be glad to submit these figures to any one who cares to see them.

(*c.*) By advice in regard to the abatement of nuisances dangerous to the public health. The State board has been frequently called upon to give advice concerning the removal of slaughter houses and other sources of the pollution of water and air. It has also been called upon to ascertain the cause of local outbreaks of infectious diseases. We may be permitted to say that such advice has generally been most kindly accepted and adopted, and that the prompt disappearance of the disease has justified the advice.

2. *The sanitary conventions.* Since 1880, the State Board of Health has held 34 sanitary conventions in different cities and villages, at the request of the citizens or local authorities. The water supply and the disposal of waste in the locality and the causation and prevention of those diseases which cause most deaths are discussed. The members of the board give from one to two days of their time to these conventions, without remuneration. That practical and valuable improvements in the sanitary condition of some of these localities have followed these conventions, we have good reason to believe. Many of the people have become interested in health matters, and the extent to which benefit may be claimed therefrom, cannot be estimated.

We believe that the educational influence of these conventions, in questions pertaining to the public health, is sufficient to justify their continuance. If they are to be continued, it cannot be done in any other way so cheaply and efficiently as it is now done. To pay seven expert sanitarians to visit various sections of the State, study the local conditions affecting the health, and to give advice concerning the best source of water supply, how to dispose of sewage and other waste, how to detect adulterations in food, and how to limit the spread of infectious diseases, would certainly cost much more than is now expended in doing the same work.

3. *The scientific work of the board.* Many people in Michigan know of some of the investigations by this board, which have added to our knowledge of the causation of diseases.

(*a.*) For several years, whenever any considerable outbreak of cheese poisoning, ice cream poisoning, or milk poisoning, occurred in the State, the board took immediate steps to secure samples of the suspected food, and to have them analyzed. Such work was done for the board by several prominent chemists and bacteriologists in Michigan and other States. At last success crowned the efforts of one chemist, a member of the board, and as a result rules for the care of milk have been formulated and have been of great service to dairymen; have greatly lessened the frequency of such cases of poisoning, and have been the means of aiding very much in diminishing the number of cases of cholera infantum, and have enabled physicians to treat this disease more successfully.

(*b.*) The board has caused numerous analyses of water suspected of causing typhoid fever to be made, and by this means harmful waters have been recognized, their use discontinued, and epidemics prevented or stamped out.

(*c.*) By the study of the relation between meteorological conditions and the prevalence of disease, we now know what diseases prevail most frequently at certain seasons of the year, and therefore can advise people of the increased danger and of the best means of avoiding the same. It has been suggested that other meteorological work is being done by the State under a special appropriation. We submit the fact that such information can be of no service in the prevention of disease unless it can be accompanied by the simultaneous collection of the statistics regarding the prevalence of disease, and the combined statistics studied by expert investigators, and then not unless there shall be some method for the practical application of the knowledge gained.

(*d.*) The relation between low water in wells and typhoid fever throughout the State has been worked out by the Secretary of the Board, and now we can predict the probable prevalence of this disease, and advise as to the means by which this can be limited.

These are a few of the scientific problems with which the Board has been endeavoring to ascertain the causes of disease. Many more problems await solution; whether or not the work shall be continued remains for you to decide.

In conclusion, we may be allowed to say that the saving of life and the prevention of disease have been the constant aims of the Board. In working to this end it has employed the best resources at its command, and we are perfectly willing that you should judge us by our work, only a brief outline of which we have attempted to place before you in this memorial. That other states and countries have deemed this work worth doing we need not inform you. The great discoveries of Pasteur and Koch have been made under the direction and by the aid of government boards which, however, are more liberally supported than this Board has been, and not only have laboratories at their disposal, but government aid for laboratory investigations.

The above is respectfully submitted, and we ask the most careful examination into the work and management of the Board.

Lansing, Michigan, February 12, 1891.

JOHN AVERY,
HENRY F. LYSTER,
JOHN H. KELLOGG,
ARTHUR HAZLEWOOD,
VICTOR C. VAUGHAN,
DELOS FALL,
HENRY B. BAKER.

2. ANNUAL EXPENDITURES BY AND ON ACCOUNT OF THE STATE BOARD OF HEALTH.

"MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Mich., February 24, 1891.

" *To the Speaker of the House of Representatives:*

" SIR—In response to a resolution of the House, received from its clerk this day, the accompanying itemized statement of the expense in this department for the latest full year, is respectfully submitted. As directed in the resolution, the salaries of clerks and janitor are added. The salary of the secretary is paid out of the special appropriation, and is included in the tabular statement of expenditures by the board. No other officer or member of the board receives compensation from the State.

" The cost of printing and binding the annual report of the board is not 'an expense of this department,' the accounts therefor are audited by the Board of State Auditors, and therefore may not have been called for by the resolution, but it is an expense on account of the existence of this board, therefore I include a statement for one year. It is impracticable for the clerk of the Board of State Auditors to give to me to-day the figures for 1889, so I give the figures for 1886, taken from page XXXI of the annual report of the State Board of Health for 1886. The annual report for 1889 is about the same size as the report for 1886.

Very respectfully,
HENRY B. BAKER, *Secretary.*"

" The message was laid on the table.

" The accompanying statement was ordered spread on the journal as follows:

"EXPENDITURES BY THE STATE BOARD OF HEALTH DURING THE CALENDAR YEAR 1889.

For chemical analyses and preparations	$45 00
Expenses of members, attending meetings and other official	714 25
Instruments and books	277 66
Paper, stationery, etc.	162 67
Postage:	
Distribution of annual reports	421 25
General distribution of pamphlets, etc.	115 77
Sending weekly and monthly bulletins	29 76
Collection and dissemination of statistics and information of communicable diseases, etc.	51 48
Sending announcements and programs of sanitary conventions	83 95
To and from meteorological observers	6 32
Regular and special correspondence of the office, and all other postage	400 47
Printing and binding	848 09
Secretary's salary	2,500 00
Periodicals	29 40
Sanitary conventions	180 59
Telephone and telegrams (including rental of telephone)	73 69
Expressage	54 03
Miscellaneous	54 40
Total expenditures by the board	$5,998 78
Salaries of clerks and janitor (Auditor General's report)	9,692 62
For paper, illustrations, printing and binding for the annual report (from figures received from clerk of the Board of State Auditors, for the year 1886)	2,708 24
Total	$18,399 64

Attest: HENRY B. BAKER, *Secretary.*"

3. ANNUAL EXPENDITURES BY EACH OF THE SEVERAL STATE BOARDS OF HEALTH.

The following statement shows a comparative list of appropriations made for the use of State Boards of Health in the United States for the year 1888, and is quoted from page 76 of the Annual Report of the Missouri State Board of Health for the year 1888:

Massachussetts	$111,300	Maryland	$13,000	Kansas	$4,500
Texas	61,000	California	12,500	Ohio	4,000
Illinois	* 49,000	Connecticut	* 10,000	South Carolina	4,000
Mississippi	46,550	New Hampshire	* 8,500	Tennessee	* 3,000
Minnesota	29,000	North Carolina	* 5,500	Rhode Island	* 2,700
New York	25,000	Indiana	* 5,000	Kentucky	* 2,500
New Jersey	* 21,500	Iowa	* 5,000	Vermont	2,500
Wisconsin	20,500	Louisiana	* 5,000	West Virginia	2,000
Michigan	* 16,145	Pennsylvania	* 5,000	Delaware	850
Alabama	13,000	Maine	5,000		

* The asterisk (*) to the totals appropriated of certain of the States indicates additional sources of revenue or advantage, as epidemic funds without definite limit, fees from different sources, free printing, etc., etc. Arranged by the Secretary of the State Board of Health of Missouri.

A classification of expenditures by the Michigan State Board of Health for the year 1889, and a statement of expenditures on account of the Board for 1886, is printed on page xxxiii of this Report.

4. LETTERS, PETITIONS, AND PROTESTS AGAINST ABOLITION OF THE STATE BOARD OF HEALTH.

Dr. George M. Sternberg, Lieut. Colonel and Surgeon, U. S. A., the well known scientist and author, ex-president of the American Public Health Association, wrote to the Secretary of the Michigan State Board of Health:—

"Is it possible that there is any serious danger that your State Board of Health may be abolished?

"The practical sanitary work done by your State Board has attracted the attention of the leading sanitarians in this country and in Europe and we have been in the habit of pointing to Michigan as one of the foremost states in the Union in all matters pertaining to sanitary administration and admonition.

"To cut off the head of your sanitary service, would be a fatal step, which at one blow would remove your state from its proud position as a leader among the commonwealths of the Republic in the enlightened policy of caring for the sanitary interests of the people.

"I trust that yourself and others who have contributed so much to the present prominence of Michigan in all matters pertaining to the preservation of the public health may not have the humiliation of finding that your efforts are not appreciated by the representatives of the people in whose interests they have been made."

From the Legislative Journal, January 29, 1891.

No. 57. By Mr. Shull: Petition of Drs. Samuel Catlin, W. A. Frost, L. G. North and five other physicians and eighty-six citizen of Tecumseh, Lenawee county, Mich., representing different schools of medicine and the several political parties, protesting against the abolishment of the State Board of Health.

On demand of Mr. Shull,

The petition was read at length, and spread at large on the Journal as follows:

To the Honorable, the Senate and the House of Representatives of the State of Michigan:

We, the undersigned, physicians of Tecumseh and vicinity, without respect to school of medicine, or party politics, respectfully petition your honorable body, to not abolish "The State Board of Health."

Our reasons, briefly stated, are as follows:

The State Board of Health is, in various ways, teaching sanitary science to both physician and people. and in such a way that both are believing and practicing its teachings.

It is uniting the efforts of the physician and the people in restricting, and in preventing the spread of contagious diseases.

It is not only saving many from sickness, with its attendant anxiety, suffering, danger, loss of time, and expense, but by preventing the spread of contagious diseases, it is yearly saving many valuable lives.

Each adult life is worth $1,000 to the State; and if, of our two million inhabitants, but thirty are saved each year, the State is more than reimbursed for all the expenses of the board.

The State Board is the head of all the local boards of health, and if it is abolished the efficiency of the whole system is destroyed.

Its abolishment will be regarded by scientific men everywhere, as a step backward by the great State of Michigan.

Samuel Catlin,
W. A. Frost,
L. G. North,
O. Q. Jones,
J. F. Jenkins,
C. M. Woodward,
Geo. Howell,
Lemon Barnes.

We, the undersigned, citizens and taxpayers of Tecumseh and vicinity, do most heartily concur in the above petition.

Signed by 86 citizens of Tecumseh, Lenawee county.

Referred to the committee on public health.

From the Legislative Journal, Feb. 3, 1891.

No. 108. By Mr. Cook: Remonstrance of Dr. O. C. Williams, Frank W. Garber, James M. Cook, Henry C. Brown, John P. Stoddard, John Vanderlain, Geo. S. Williams and Chas. P. Donaldson, against the abolition of the State Board of Health.

On demand of Mr. Cook,

The petition was read at length and spread at large upon the Journal as follows:

To the Honorable Senate and House of Representatives of the State of Michigan in Legislature convened:

Your petitioners, the Muskegon Medical Club, at their regular meeting, held January 20, 1891, passed the following resolutions for your careful consideration:

WHEREAS, An effort is being made to abolish one of the best known and honored institutions of the State, the State Board of Health;

WHEREAS, The State Board of Health is performing one of the highest missions in matters of education, by teaching the people how to prevent disease, and how to stamp out contagious and infectious diseases wherever they may be found;

WHEREAS, Several portions of our State suffer from frequent epidemics and contagious diseases of great severity, in which the mortality sometimes is alarming, evidences are fully established that the State Board of Health has caused great amelioration in these respects;

Resolved, That we, as a club, and as individuals, urge that before you cause the State Board of Health to be abolished, you fully consider of how great importance it is to the health of the people of the State of Michigan.

DR. O. C. WILLIAMS, *President*,
DR. FRANK W. GARBER, *Secretary*,
DR. JAS. M. COOK,
DR. HENRY C. BROWN,
JOHN P. STODDARD, M. D.,
JNO. VANDER LAAU,
GEO. S. WILLIAMS,
CHAS. P. DONELSON, *Chairman Com.*

Referred to the committee on State affairs.

From the Legislative Journal, February 3, 1891.

No. 112. By Mr. Osborne: Resolutions of citizens of St. Joseph county against the abolition of the State Board of Health.

On demand of Mr. Osborn.

The resolution was read at length, and spread at large on the Journal, as follows:

Centreville, Mich., January 16, 1891.

WHEREAS, We, the citizens of Centreville and vicinity, having learned from the public press that there is a bill before the Legislature of Michigan, which provides for the abolishing of our present State Board of Health; therefore be it

Resolved, By said citizens of St. Joseph county, Michigan, in convention assembled, that we are earnestly opposed to said bill and any interference with our present law providing for such Board of Health; and

Resolved, That our Senator and Representative be and are hereby requested to use all honorable means to defeat said bill, and to do all in their power to preserve our present State Board of Health as an independent board and if possible to aid said board in its work of scientific investigation and dissemination of the knowledge of the laws of diseases and their prevention;

And resolved, That our secretary of this convention forward copies of these resolutions to our Senator and Representative at Lansing as the sense of this convention.

Referred to the committee on public health.

From the Legislative Journal, March 3, 1891.

No. 552. By Mr. Wachtel: Memorial of The Provincial Board of Health of Canada.

On demand of Mr. Wachtel,

The memorial was read at length, and spread at large on the Journal as follows:

Toronto, February 27, 1891.

To the Governor and Members of the Michigan State Legislature:

GENTLEMEN—This board has learned with much suprise from the Medical Press that a resolution has been introduced into the State Legislature with a view to the abolition of the Michigan State Board of Health.

This board is wholly unacquainted with any of the causes, either of an executive or political character, which may have led to the introduction of said resolution to the Legislature; but it most respectfully desires to emphasize a few results which would logically follow the abolition of the said board:

1. It would bring prominently before the attention of every State of the Union, and every province of Canada, the fact that a health board, almost the oldest, and one of the most favorably known on the whole continent, through its activity in practical work, and through its advanced views on sanitation, has been abolished, owing to local influences which have temporarily been placed higher than the public good.

2. That those health boards of a whole continent, which in the past have looked for encouragement and inspiration to Michigan, have seen suddenly blotted out of existence an organization, which in many phases of its work has done more to advance sanitation on this continent, than almost any other single board.

3. That health boards and the public generally of all neighboring states and provinces will view with alarm the absence of a State Board from a territory, through which probably more than through any other single state or province immigrants are transported, and which has, times innumerable during the last ten years, been a guarantee that small-pox and other contagious diseases imported or developed in said territory, would be promptly quarantined, and the danger of their spread to neighboring states and provinces be practically removed.

4. That all the representatives at the National Conference of State Boards of Health, held during the annual meeting of the American Public Health Association in Toronto, in 1886, gave their adhesion to the following resolutions:

> WHEREAS, It is necessary for the protection and preservation of the public health that prompt information should be given of the existence of cholera, yellow fever and small-pox; therefore be it
>
> 1. *Resolved*, That it is the sense of this National Conference of State Boards of Health, that it is the duty of each state, provincial and local board of health in any locality in which any of the said diseases may at any time occur, to furnish immediate information of the existence of such disease to boards of health of neighboring and provincial states and to the local boards in such states as have no state board.
>
> 2. That upon rumor or report of the existence of pestilential disease, and in case positive definite information thereon be not obtainable from the proper authorities, this conference recommends that the health officials of one state shall be privileged and justified to go into another state for the purpose of investigating and establishing the truth or falsity of such reports.
>
> 3. That whenever practicable, investigations made under the preceding section shall be carried out with the co-operation of the state or local health authorities.
>
> 4. That any case which presents symptoms seriously suspicious of one of the aforesaid diseases shall be treated as suspicious, and reported as provided for in cases announced as actual,
>
> 5. That any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not pestilential, shall be reported as suspicious.
>
> 6. That any case respecting which efforts are made to conceal its existence, full history and true nature, shall be deemed suspicious and action taken accordingly.
>
> 7. That in accordance with the provisions of the foregoing resolutions, the Boards of Health of the United States and Canada represented at this conference do pledge themselves to an interchange of information as herein provided.

As amongst these States and Provinces, your State was represented, it will be apparent that the absence from Michigan of a State board, will force neighboring States and Provinces, during the existence there of an outbreak of any of the more serious contagious diseases, to take measures for their protection which would most injuriously affect the prosperity of a State having very great railroad and commercial interests. What this may at any time mean, should your State be deprived of the services of its State Board is illustrated by what was experienced by Michigan, but much more by Ontario, during the time when they were exposed to small-pox from Montreal.

The province of Quebec with no provincial board of health, had 7,000 deaths from small-pox in 1885, with a loss of millions of dollars; while Ontario with a provincial board, had but 19 deaths from the same disease, with an expenditure for these results not exceeding $15,000.

With such well established facts before it, which might be indefinitely multiplied, this board would respectfully urge upon every citizen of Michigan and upon every representative in its Legislature, to consider fully the results, which must of necessity follow, should such a step as the abolition of the State Board of Health of Michigan be decided upon.

We have the honor very respectfully to submit the above facts for the consideration of your honorable body.

JNO. J. CASSIDY, *Chairman.*
PETER H. BRYCE, *Secretary.*

Hon. P. B. Wachtel, Speaker of the House of the Michigan Legislature.

Referred to committee on public health.

5. AN INCIDENT ILLUSTRATIVE OF THE NEED FOR CONSTANT WATCHFULNESS TO PREVENT THE SPREAD OF DANGEROUS DISEASES.

There is a great responsibilty in guarding the life and health of the two millions of citizens in Michigan,—some of whom are endangered by contagious diseases in every week of every year.

Something of the nature of what may happen any day may be suggested by the facts existing at the time of the great epidemic of small-pox at Montreal, in 1885, which resulted from a single case of small-pox that went in a sleeping car through Michigan from Chicago to Canada, and concerning which messages were exchanged by the Office of the Michigan State Board of Health with the health authorities at Montreal, previous to the epidemic. In Michigan, although at about the time it began in Montreal, a few cases occurred in several places along the line of the railroad, such measures were taken that no epidemic occurred; and after the epidemic arose in Montreal, a vigorous system of inspection of immigrants from Canada was established by the Michigan State Board of Health, over twenty thousand travelers were inspected, hundreds of them were vaccinated, hundreds of pieces of baggage were disinfected, general vaccination of citizens was recommended, and thousands heeded the advice. The result was that Michigan was entirely free from the disease, while in Montreal there were over three thousand deaths; and there were estimated to have been nine thousand cases, and a money loss of over one million dollars. This shows the great advantage of the present Michigan system.*

6. COST AND UTILITY OF ANNUAL REPORTS AND PUBLICATIONS BY THE STATE BOARD OF HEALTH.

Lansing, Mich., May 5, 1891.

HON. JOHN BASTONE, *State Senator and Chairman of Committee, Lansing, Michigan:*

DEAR SIR—In further compliance with your request, I have learned as nearly as I could, the average annual cost of all printing and binding by, and on account of, the State Board of Health. It seems to be $3,418.30; of which only about seven hundred dollars is expended by the State Board of Health; the remaining twenty-seven hundred is for the Annual Report.

As stated to you, the cost of printing and binding the Annual Report of the State Board of Health "for the use of the Legislature," etc., is not an expense by the State Board of Health; this Board is not, by law, required or permitted to audit such accounts; but as it may save your time, I send you a statement of the expense for a single year, as near as I could learn it from the office of the Board of Auditors. I presume it is a fair average statement. It is as follows: "For paper, illustrations, printing and binding for the annual report (from figures received from clerk of the board of State Auditors, for the year 1886) $2,708.24.

The number of Annual Reports printed is about six thousand per year; varying a little with the increase of officers authorized to receive them. Only three thousand five hundred are at the disposal of the State Board of Health. Under the present law, the Secretary of State distributes the others, to members of the legislature, and other officers. The entire cost of the printing and binding of the Annual Reports and Supplements, is, as I believe, about twenty-seven hundred dollars per year. If there is a single useful life saved to the State thereby, in each year, it is not a very large amount of tax upon the entire people of the State. It is believed, however, that through the facts, statistics and suggestions in the Annual Reports many valuable lives are saved in Michigan in every year. By exchange, with other states and countries, the reports are the means of securing many valuable books and pamphlets, for the use of the State Board of Health, and the benefit of the people of this State.

A statement of all expenses by this Board, for printing and binding, for each of the five calendar years, from 1886 to 1890, inclusive, is as follows: 1886, $595.50; 1887, $536.76; 1888, $789.82; 1889, $848.09; and in 1890, $780.12. The average per year is $710.06.

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* The third paragraph from the close of the last preceding article shows the results in the province of Ontario, which adjoins Michigan on the east, and had an effective Board of Health, compared with the province of Quebec, which contains Montreal, and in which there was then no Provincial Board of Health.

This printing and binding includes all the blanks for reports to the State Board of Health, also the few reprints (economically made from the Reports and Supplements while they are in type) of each paper which is needed for separate use, and the use of which frequently saves the sending of the entire volume. It includes more especially, the several pamphlets of instructions for the restriction and prevention of each of the dangerous communicable diseases; these pamphlets are printed by the thousands; and are being distributed every day, from the office of the State Board, they being sent to those localities in which the dangerous diseases are, at the time reported present. The local health officer is requested to distribute the pamphlets to the neighbors of the persons sick with the disease. We have had positive evidence from many localities that some of the most dangerous diseases have been restricted through the use of these pamphlets issued by the State Board of Health. We have reason to believe that many hundreds of lives per year are now being saved through this one measure; and at an expense which, compared with many of the expenditures by the State, is, certainly, trivial, especially in view of the much greater sums of money actually saved to the people of the State through the prevention of expenses incident to hundreds of deaths which, except for this action by the State, would occur in Michigan. This seven hundred and ten dollars per year is the entire cost of all printing and binding by the State Board of Health; including those pamphlets which careless persons have recently mentioned as "useless pamphlets," but which it is known by those familiar with the subject are doing much for the prevention of sickness and deaths in Michigan, and which might be made to do more if the State Board of Health were provided with means for increasing its work.

Very Respectfullly,
HENRY B. BAKER,
Secretary.

7. ORGANIZATION AND FUNCTIONS OF THE STATE BOARD OF HEALTH AS STATED IN THE LEGISLATIVE MANUAL.

"The State Board of Health consisting of six members appointed by the Governor for a term of six years (and a secretary elected by the board), has a general supervision of the interests of life and health of the people of the State. By the coöperation of local boards of health, of which there is one in every township, city and village in Michigan, it aims at the suppression and exclusion from the State of the dangerous communicable diseases, especially diphtheria, scarlet fever and small-pox. To this end it publishes and distributes widely, circulars of instructions to local officers and to the general public, for the restriction and prevention of these diseases. It investigates the origin and spread of epidemics of these diseases, and constantly urges upon local officers the feasibility of preventing such outbreaks, or of confining them within the narrowest limits.

"By the frequent distribution of circulars calling attention to the law and asking a return of the name and address of a health officer, the Board secures a complete organization of the local boards of health under the law. To the local boards thus organized the State Board issues circulars of instruction as to their powers and duties; and by its advice it aids local boards in their work of regulating and abating nuisances and preventing sickness.

"By holding popular sanitary conventions in various parts of the State, the Board seeks, by the aid of leading physicians and other educated men, to interest and instruct the people in measures for the preservation of health, such as the proper heating, ventilating and lighting of dwellings, cars and public buildings; the drainage and sewerage of towns and houses; the preservation of a pure water supply; the prevention of adulterations of food; the restriction of contagious diseases; the sanitary regulation of schools, and other kindred subjects.

"In connection with the State Board of Corrections and Charities, the Board of Health examines and criticises or approves plans for public buildings authorized by the Legislature to be erected or enlarged. The Board collects statistics of sickness and of meterological conditions, and by a systematic study of these, seeks to learn the causes of diseases, and to elaborate information for the benefit of the people, and especially for the guidance of the legal guardians of the health of the people.

"The Board publishes an annual report. It also distributes separate reprints of papers in the report, and of pamphlets on the restriction and prevention of various diseases.—*Howell's Annotated Statutes, §§1622-1632; Act No. 230, Public Acts of 1885.*"*

8. PROPOSED LEGISLATION, AND LAWS PASSED IN MICHIGAN IN 1891, ON SUBJECTS RELATING DIRECTLY OR INDIRECTLY TO THE PUBLIC HEALTH AND SAFETY.

At the meeting of the State Board of Health at Niles, February 5, 1891, the Secretary was instructed to prepare several Bills relating to public-health subjects, and send them to the legislature for consideration. Four Bills were prepared, and copies were sent to Hon. John S. Beers, M. D., Senator from the Ninth District, who introduced these bills into the Senate. A copy of each of the Bills was sent to the Hon. P. B. Wachtel, speaker of the House of Representatives, with briefly stated reasons why they should pass, as follows:—

[Copied from pages 321-2 of the Michigan Legislative Journal, for 1891, pages 518-19, of the "Journal of the House of Representatives."]

MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Michigan, February 24, 1891.

To the Speaker of the House of Representatives:

SIR—Experience in executing the health laws of Michigan reveals imperfections, and dangerous diseases are spread through some imperfections which, it seems to me the Legislature would amend if its members were to give attention to the subject Although each district has its Senator or Representative, there seems to be no Senator or member whose duty it is to specially look after the interests of the State as a whole. Therefore I transmit to you four proposed bills designed to improve the health laws of Michigan, in the hope that some member of the House, the popular branch of the Legislature, may have sufficient interest in the subject to introduce the bills which I transmit, or some other bills designed to improve the health laws of the State in some or all of the directions indicated. The bills are as follows:

1. "A bill to prevent the introduction of a dangerous communicable disease into any township, city or village in Michigan, except under specified regulations." It may seem strange to you, but I think it is a fact that any person sick with small-pox or other dangerous communicable disease, may enter and travel through most of the townships, cities and villages in Michigan, and there is no statute law to forbid or prevent.

2. "A bill to prevent the spread of dangerous communicable diseases, by providing for the punishment of willful offenders." The purpose of this bill is expressed in its title. It is designed to be useful in preventing the spread of dangerous communicable diseases in townships, cities and villages in which they occur.

3. "A bill to fix the salary of a chief clerk in the office of the State Board of Health."

Under the present law no clerk in the office of the State Board of Health receives a salary to exceed $1,000 per year, although every other department of the State service has, I think, a chief clerk, or at least one clerk who receives more than that. Under existing laws, official duties not infrequently call the secretary to parts of the State at a distance from the capitol when, through messages sometimes from without the State, questions arise which may involve the spread of a dangerous disease. The question is respectfully suggested whether the interests of health and life of the citizens of Michigan do not call for legislative provision for an assistant secretary or chief clerk in the office of the State Board of Health, more especially to act during the necessary absences of the Secretary, and temporarily in the event of his death or disability. The bill sent herewith is not up to my ideal, but it is sent as a suggestion.

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* Official Directory and Legislative Manual, of the State of Michigan, 1891, pp. 511-512.

4. "A bill to make an appropriation for analyses of suspected waters, foods and other substances, and otherwise to increase the efficiency of the State Board of Health in restricting dangerous diseases."

The purpose is expressed in the title, and is concisely and clearly stated in the bill. The State Board of Health has for many years done something in this direction, but it must be apparent to every intelligent person that its appropriation (six thousand dollars for all the many purposes specified in the laws) is entirely inadequate.

If the State of Michigan has interests higher or more important than those which it has in the best possible protection of the life and health of every man, woman and child in the State, I do not know which educational institution, asylum, or other institution or department of the State government is intrusted with them. Yet few of the great institutions or departments of the State government have so small annual expenditures as does the State Board of Health.

These bills would have been sent to you earlier except that I have been waiting to hear from the committees on public health, to whom communications relative thereto were transmitted.

Very respectfully,

Henry B. Baker,

Secretary.

The fate of these four bills is indicated below. One of them became a law.

1. *House Bill No. 643, House File No. 144.*—Introduced by P. B. Wachtel, by request. "A bill to prevent the introduction of a dangerous communicable disease into any township, city or village in Michigan, except under specified regulations." This bill passed the House, March 11, 1891, was transmitted to the Senate for concurrence, March 13, 1891; in the Senate it was referred to the public-health committee, where it remained until the end of the session.

A similar bill, having the same title, introduced in the Senate by Hon. John S. Beers, M. D., was referred to the Senate public-health committee in the Senate, which made no report upon it.

2. *House Bill No. 642, House File No. 142.*—Introduced by the Hon. P. B. Wachtel, by request. "A bill to prevent the spread of dangerous communicable diseases, by providing for the punishment of wilful offenders." This bill passed the House, March 11, 1891, passed the Senate without amendments, and was approved by the Governor, March 27, 1891. It is Act No. 15, Laws of 1891.

3. *House Bill No. 641.*—Introduced by Hon. P. B. Wachtel, by request. "A bill to fix the salary of a chief clerk in the Office of the State Board of Health." This bill was reported adversely by the public-health committee in the House, June 9, 1891.

A similar bill, having the same title, was introduced in the Senate by the Hon. J. S. Beers, M. D., and referred to the public-health committee in the Senate. The committee did not make any report on the bill.

4. *House Bill No. 640.*—Introduced by Hon. P. B. Wachtel, by request. "A bill to make an appropriation for the analyses of suspected waters, foods and other substances and to otherwise increase the efficiency of the State Board of Health in restricting dangerous diseases."

This bill was reported adversely by the public health committee in the House June 9, 1891. A similar bill, having the same title, was introduced in the Senate by the Hon. J. S. Beers, M. D., and referred to the public health committee. The committee did not make any report on the bill.

Senate bill No. 252, File No. 176.—Introduced by Senator Toan. A bill "to regulate the practice and business of embalming the dead bodies of human beings."

The bill, as introduced by Senator Toan, was tabled February 25, 1891. It was taken from the table and referred to the public health committee in the Senate March 18; reported with substitute and substitute concurred in, ordered printed, passed the committee of the whole, and passed the third reading. The bill was transmitted to the House, where it failed to pass.

Laws passed in Michigan in 1891.

Only three of the acts passed by the last legislature have been found which seem to relate, directly or indirectly, to the public health and safety; one is to prevent the spread of dangerous diseases, and the bill was prepared in this office, one relates to oleomargarine, and the other was to change and lower the test of illuminating oils, the inspection having been designed for the safety of life and property. The titles and substances of the acts are as follows:—

Act No. 15, Laws of 1891.—"To prevent the spread of dangerous communicable diseases, by providing for the punishment of wilful offenders."

This Act provides a penalty of "a fine of not less than twenty-five dollars, nor more than one hundred dollars, or by imprisonment in the county jail not less than twenty days, nor more than ninety days," for any person who shall knowingly or wilfully subject, or be instrumental in subjecting, another person to the danger of contracting small-pox, diphtheria or scarlet fever. Approved March 27, 1891, and will take effect October 1, 1891.

Act No. 45, Laws of 1891.—An Act "To prohibit the use of oleomargarine, butterine, or any other substitute for butter in any of the public institutions of this State, and to provide punishment therefor."

This may be intended to be, but there is nothing in the law which alleges that it is, a law in the interests of the public health. It is probably "An act for the protection of dairymen," as Act No. 34, Laws of 1881, is partially entitled.

Act No. 71, Laws of 1891.—An Act "To amend sections two, five and six of act No. 127 of the public acts of 1879, as amended by act No. 49 of the public acts of 1881, being compiler's sections 1538 and 1541 of Howell's annotated statutes, as amended by act No. 20 of the public acts of 1888, relative to the inspection of illuminating oils." This act takes effect July 1, 1891. It amends section two, so that the "Tagliabue's open cup" tester is to be used instead of the one "adopted and recommended by the Michigan State Board of Health;" the burning test is required in place of the flash test, at a temperature of one hundred and twenty degrees of Fahrenheit's thermometer; and, the provision for not less than one-half pint of oil to be used in testing is stricken out. The amendments to section five are substantially the same as those made in section two—substituting for the words "emit a combustible vapor" the words "ignite and burn" * * * "and when tested by the ordinary formula in Tagliabue's open cup." Section six is amended so as to read "that in no case shall any deputy inspector receive more than seventy-five (formerly one hundred) dollars in any month as such salary."

WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1891.

For each regular meeting of the State Board of Health the Secretary prepares a report of work in the office during the preceding quarter. The abstracts of these might be published with the proceedings of the several meetings; but are collected and published here in order to bring the report of work in the office all together. Following these quarterly reports will be found a general report for the year.

ABSTRACT OF SECRETARY'S QUARTERLY REPORTS, DURING THE YEAR ENDING JUNE 30, 1891.*

SECRETARY'S REPORT OF WORK IN THE OFFICE OF THE STATE BOARD OF HEALTH DURING THE SIX MONTHS ENDING OCTOBER 13, 1890.

During the last two quarters the office has received information of, and taken action relative to 221 outbreaks of diphtheria, 202 outbreaks of scarlet fever, 179 outbreaks of typhoid fever, and 243 outbreaks of measles. The usual numbers of pamphlets on the restriction of these diseases have been sent to the localities where these diseases prevailed. No case of small-pox has been reported during the second and third quarters of 1890.

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* Including, also, the Second quarter of the calendar year 1890, because the report for that quarter was not made at the close of the quarter, but was included with the report for the following quarter.

A little over 1,700 pages of letter-copy book have been used since the April meeting.

The Public-health Laws of Michigan, compiled last year, have been carefully examined, the proof on the compilation has been read, table of contents and index prepared, and the book is nearly ready for distribution.

The copy for that part of the Annual Report for the year 1889 which follows the articles on meteorology and the weekly reports of diseases has been carefully edited and the articles up to the one relative to typhoid fever have been printed. The last part of the article relative to typhoid fever, was somewhat delayed by the preparation of further evidence on the relation of low water in wells, and the height of ground above the ground water, to the prevalence of typhoid fever in Michigan.

ANNUAL REPORTS OF HEALTH OFFICERS AND CLERKS, AND THEIR COMPILATION.

Since the last regular meeting of this Board a compilation has been made from the annual reports of health officers and clerks of local boards, the compilation including all the deaths and cases reported as having occurred during the year 1889, from the following-named dangerous communicable diseases:—diphtheria, scarlet fever, typhoid fever, measles, and whooping-cough. The information from this source is to be united with that from the special reports relative to those diseases, and with that derived from the weekly postal-reports. The whole number of annual reports from which the compilations were made, are as follows:—

From health officers	732
From clerks	700
Total	1,432

REPORTS OF NAMES AND ADDRESSES OF PRACTICING PHYSICIANS.

Under the law, Act No. 268, Laws of 1887, it is the duty of the supervisor at the time of making the annual assessment in each year, to make a list of all physicians within his township, village, ward, or city as the case may be, and to return such list to the village or city clerk, "and annually on or before the first day of January, such clerks shall furnish certified lists of the same to the Secretary of the State Board of Health." This law is not being generally obeyed. During the year 1890 only 429 out of a possible 1,517 reports have been received, and most of these reports have come from townships and small villages, in which the population was not great, in many cases there being no physician in the township. The result is, that the intention of the law to supply to the office of the State Board of Health information relative to the medical practitioners throughout the State, is not fulfilled and the information has to be obtained from other sources. The best available source is the "Medical and Surgical Directory" compiled by R. L. Polk & Co., of Detroit, but the latest edition seems to be not later than that of 1886.

METEOROLOGICAL REPORTS AND WORK IN THE OFFICE.

Since the last report (April, 1890), the weekly and monthly summary of meteorological conditions at this station have been made, and a copy of the monthly summary sent, each month, to the Chief Signal Officer at

Washington, D. C., and also a copy to Sergt. N. B. Conger, Director of the Michigan State Weather Service, at Lansing, Mich.

Compilations of the meteorological conditions for the year 1889, at 24 stations in different parts of the State, are nearly completed, and 26 diagrams made in the photo-engraver's ink, ready for the photo-engraver.

Meteorological registers have been received and examined from 22 stations in Michigan—for each of the months, April to August, and from nearly all of those stations for September, 1890. The computation of all the meteorological conditions on these registers from January to August, 1890, has been made (but not proved) except for the absolute and relative humidity, observations of the barometer, and of fog.

SANITARY CONVENTIONS HELD.

Two successful sanitary conventions were held, one at Alpena, July 10 and 11, and one at Charlevoix, August 14 and 15. These were attended by the secretary, as well as by other members of this board.

A PUBLIC MEETING AT HOLLAND, OTTAWA COUNTY.

On account of difficulty in restricting diphtheria, the health officer and other prominent citizens of Holland asked that a sanitary convention under the auspices of the State Board of Health, be held in Holland; and arrangements were made for one; but the time set for it was so distant that it seemed desirable to hold at once a public meeting for the special purpose of placing before the citizens generally the best means for the restriction of diphtheria. July 17, such a public meeting was held, at which the mayor of the city presided; and, on invitation received from the board of health of Holland, Doctors Avery, Hazlewood, and Baker, of the State Board of Health, attended and spoke at the meeting. The secretary of this board also distributed to the audience, which was a large one, copies of the documents, issued by the State Board of Health, on the best measures for the restriction of diphtheria. [The paper which he read is printed further on in this report.]

NOTICES, PAMPHLETS, BLANKS, ETC., ISSUED.

Announcements for Sanitary Conventions to be held at Holland, Niles, and Centerville, have been printed and liberally distributed. Programs for the Sanitary Conventions held at Alpena and Charlevoix were printed and distributed. Announcements for the postponement of the Convention at Holland have been distributed in order that those previously invited, might not be misled into going at the wrong time.

At the Alpena Convention about 250 copies of pamphlet Supplements to the Annual Reports of this Board, and 103 sets of pamphlets and diagrams were distributed. At the Charlevoix Convention about 50 sets of pamphlets and diagrams, and about 120 copies of pamphlet proceedings of sanitary conventions were distributed. The usual number of pamphlets have been sent where communicable diseases prevailed, supplying instructions how to restrict such diseases. The list of health officers for townships, villages, and cities has been compiled, printed, and sent to all the health officers, and to the supervisors or presidents of villages and mayors of cities where no health officer was returned. The number of copies sent out was about 1,519; this being the number of local boards of health in Michigan.

The usual documents, pamphlets, blanks, etc., have been sent to each health officer of a township, village, and city as soon as his name was returned; also to the clerk of each township, village, and city who made report of the name of a health officer for his township, village, or city.

The usual work of keeping a record of the documents sent out from, and received in the office has been kept up.

JOURNALS, BOOKS, AND PAMPHLETS RECEIVED.

During the last two quarters, the numbers of journals received at the office of the State Board of Health, mainly in exchange for the publications of this Board were as follows:

Journals.	First Quarter.	Second Quarter.
Quarterly	4	1
Monthly	184	111
Semi-Monthly	37	37
Weekly	284	266

During the quarter ending June 30, 1890, there were 120 books and pamphlets added to the library of the Board.

Among the hecktograph work done during this second quarter, were copies of report, and supplementary report, of examination by this Board of plans for the new buildings at the State Reform School.

During the quarter ending Sept. 30, 1890, there were 98 books and pamphlets added to the library of the Board.

Hecktograph and mimeograph work was made, during the third quarter to the number of 3,057 pages, among which were letters on "Sulphurous Disinfection," and "How Diphtheria is Spread by Corpses;" said articles were distributed to members of the Board, sanitary exchanges, secretaries of other State Boards of Health, and others where it was thought they would do good.

COMMUNICABLE DISEASES.

Quarter Ending June 30, 1890.

The number of outbreaks of communicable diseases of which information was received, from all sources, and filed, and the corresponding numbers of special letters sent during the quarter, were as follows:—for diphtheria, 118; scarlet fever, 94; typhoid and typho-malarial fever, 52; measles, 189. Total for the five diseases, 453. (No small-pox was reported.)

The "Final" reports received and filed during the quarter, were: for diphtheria, 65; scarlet fever, 76; typhoid and typho-malarial fever, 18; measles, 8.

Written cards and demands for weekly or final reports, on cards, or in the form of the circular letter, were sent during the quarter, to the number of 792. Besides this, card receipts for communications from health officers and others were sent of which no record is kept.

Newspapers to the number of 2,348 have been looked over during the quarter for reports of communicable diseases. This has resulted in giving this office information of the occurrence of 24 outbreaks of diphtheria, 8 outbreaks of scarlet fever, 15 outbreaks of typhoid and typho-malarial fever, and 64 outbreaks of measles, during the quarter.

TABLE 4.—*Showing the number of outbreaks of Diphtheria, Scarlet fever, Typhoid fever and Measles, from April 1, to June 30, 1890, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, information concerning which was received through the newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of newspaper reports which were denied by the health officer, and the per cent of newspaper reports in regard to which no reply was received from the health officer.*

DISEASES.	Reports from *all* sources, April 1—June 30, 1890.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria	118	20	29	29	42
Scarlet fever	94	9	38	25	38
Typhoid fever	52	29	13	20	67
Measles	189	34	38	20	42
Averages for the four Diseases	....	23	29	24	47

COMMUNICABLE DISEASES.

Quarter Ending Sept. 30, 1890.

The number of reports of *outbreaks* of dangerous communicable diseases received from all sources and filed, and the corresponding number of circular letters sent during the quarter, are as follows: for diphtheria, 103; for scarlet fever, 108; for typhoid and typho-malarial fever, 127; for measles, 54. Total for the five diseases, 392. (No small-pox was reported.)

The "Final" reports received and filed during the quarter, were: for diphtheria, 76; scarlet fever, 73; typhoid and typho-malarial fever, 33; measles, 19. Total for the five diseases, 201.

Written cards, and demands for weekly or final reports, on cards, or in the form of the circular letter, were sent out during the quarter, to the number of 539.

Newspapers (local columns), to the number of 1,844 have been looked over during the quarter for reports of communicable diseases. This has resulted in giving this office information of the occurrence of 12 outbreaks of diphtheria, 11 outbreaks of scarlet fever, 16 outbreaks of typhoid and typho-malarial fever, and 3 outbreaks of measles.

The number of communications relative to dangerous communicable diseases received and placed on file during the quarter was 977.

TABLE 5.—*Showing the number of outbreaks of Diphtheria, Scarlet fever, Typhoid fever, and Measles from July 1 to September 30, 1890, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, information concerning which was received through the newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of newspaper reports which were denied by the health officer, and the per cent of newspaper reports in regard to which no reply was received from the health officer.*

Diseases.	Reports from *all* sources, July 1 to Sept. 30, 1890.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria	103	12	58	0	42
Scarlet fever	108	10	27	18	55
Typhoid fever	127	13	38	31	31
Measles	54	6	33	33	33
Averages for the four Diseases	....	10	39	21	40

During the second quarter of 1890, 3,675 postal cards, and 245 record books were sent to 245 health officers and regular correspondents; the weekly card-reports received were entered and compiled; 42 copies of the hektographed weekly bulletin, "Health in Michigan," were mailed each week; 79 copies of the monthly bulletin, "Health in Michigan," and 121 copies of the diagram of "Comparative Sickness," have been hectographed and mailed each month.

These bulletins have also been consolidated for the quarterly report made today. Work has been done on the compilation of the weekly card-reports of sickness for the Annual Report.

During the third quarter of 1890, 2,340 postal cards and 156 record books were sent to 156 health officers and regular correspondents; the weekly card reports received were entered and compiled; 42 copies of the weekly bulletin, "Health in Michigan," were hektographed and mailed each week; 80 copies of the monthly bulletin, "Health in Michigan," and of the diagram of "Comparative Sickness," have been hektographed and mailed each month.

These bulletins have also been consolidated for the quarterly report made today. Work has been done on the compilation of the weekly card-reports of sickness for the Annual Report.

HEALTH IN MICHIGAN IN THE SECOND QUARTER OF 1890.

Communicable Diseases.

Compared with the preceding quarter (January, February and March, 1890), reports from all sources show *diphtheria* to have decreased by an average of two places per month, *scarlet fever* to have decreased by an average of *fourteen* places per month, *typhoid fever* to have decreased by an average of *thirteen* places per month, measles to have increased by an average of *thirty-seven* places per month and *small-pox* to have decreased by an average of *one* place per month,—disappeared before this quarter began.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of meteorological conditions of the second quarter of 1890, with the meteorological conditions of the preceding quarter, shows the temperature to have been much higher, the absolute humidity to have been considerably more, the relative humidity to have been slighly less, the day and the night ozone to have been more, the rainfall at Lansing to have been 2.53 inches more and the depth of ground above the water in the well at Lansing to have been ten inches less in the second quarter of 1890.

Compared with the preceding quarter (January, February and March, 1890), the reports from regular observers show a marked increase of cholera morbus, typho-malarial fever, inflammation of brain, measles, dysentery, cholera infantum and puerperal fever, and a marked decrease of small-pox, pneumonia, influenza, pleuritis and typhoid fever (enteric) in the second quarter of 1890.

This Quarter Compared with the Average for four Years, 1886-1889. (As regards rainfall and ground water, the periods are different.)

A comparison of the meteorological conditions of the second quarter of 1890, with the average of corresponding quarters in the four years, 1886–1889, shows that in 1890, the temperature was the same, the absolute humidity was slightly more, the relative humidity was the same, the day, ozone and the night ozone were more.

In the second quarter of 1890, the rainfall at Lansing was 1.13 inches more than for the corresponding quarters in the eleven years 1879–1889, and the depth of ground above the water in the well at Lansing, was ten inches more than in the corresponding quarters in the five years 1885–1889.

Compared with the average for the corresponding quarters in the four years, 1886–1889, the reports received from regular observers indicate that membranous croup, measles and cholera infantum were more prevalent, and the typho-malarial fever, cholera morbus, typhoid fever (enteric) and intermittent fever were less than usually prevalent in the second quarter of 1890.

HEALTH IN MICHIGAN IN THE THIRD QUARTER OF 1890.

Communicable Diseases.

Compared with the preceding quarter (April, May and June, 1890), reports from all sources show *diphtheria* to have decreased by an average of *six* places per month, *scarlet fever* to have been the same, *typhoid fever* to have increased by an average of *thirty-one* places per month, and *measles* to have decreased by an average of *sixty-eight* places per month.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of meteorological conditions of the third quarter of 1890, with the meteorological conditions of the preceding quarter, shows the temperature to have been higher, the absolute humidity to have been more, the relative humidity to have been slightly more, the day ozone and the night ozone to have been less, the rainfall at Lansing to have been 2.5 inches less, and the depth of ground above the water in the well at Lansing to have been one inch less, in the third quarter of 1890.

Compared with the preceding quarter (April, May and June, 1890), the reports from regular observers show a marked increase of cholera infantum, cholera morbus, dysentery, typhoid fever (enteric) diarrhea, typho-malarial fever and inflammation of bowels, and a marked decrease of membranous croup, measles, puerperal fever, pneumonia, inflammation of brain, influenza, remittent fever and cerebro-spinal meningitis, in the third quarter of 1890.

This Quarter Compared with the Average for the Four Years, 1886–1889. (As regards rainfall and ground water the periods are different.)

A comparison of the meteorological conditions of the third quarter of 1890, with the average of corresponding quarters in the four years, 1886–1889, shows that in 1890, the temperature was slightly lower, the absolute humidity was slightly less, the relative humidity was the same, the day ozone and the night ozone were slightly more in the third quarter of 1890.

In the third quarter of 1890, the rainfall at Lansing was 1.06 inches less than for the corresponding quarters in the eleven years, 1879–1889, and the depth of ground above the water in the well at Lansing was five inches more than in the corresponding quarters in the five years, 1885–1889.

Compared with the average for the corresponding quarters in the four years, 1886–1889, the reports received from regular observers indicate that neuralgia, measles, influenza, cerebro-spinal meningitis and scarlet fever were more prevalent, and that puerperal fever, typho-malarial fever, inflammation of brain, whooping-cough and typhoid fever (enteric) were less than usually prevalent in the third quarter of 1890.

Respectfully submitted,
HENRY B. BAKER,
Secretary.

ABSTRACT OF THE SECRETARY'S REPORT OF WORK DONE IN THE OFFICE OF THE BOARD, DURING THE QUARTER ENDING DECEMBER 31, 1890.

Dangerous Communicable Diseases.

The number of reports of outbreaks of dangerous communicable diseases in Michigan, received from all sources and filed, and the corresponding number concerning which action was taken by this office, during the quarter, are as follows: for diphtheria, 108; for scarlet fever, 144; for typhoid and typho-malarial fever, 102; for measles, 27. Total for the five diseases, 381. (No small-pox was reported.)

The number of communications relative to dangerous communicable diseases, received and placed on file during the quarter, was 989.

Relative to dangerous communicable diseases, letters, written cards, and demands for weekly or final reports, on cards, or in the form of the circular letter, were sent out during the quarter, to the number of 894.

The "Final" reports of outbreaks received and filed during the quarter, were: for diphtheria, 63; scarlet fever, 73; typhoid and typho-malarial fever, 61; measles, 0. Total for the five diseases, 197.

During the quarter, the local columns of newspapers to the number of 2,054, have been looked over for reports of occurrence of communicable diseases. This has resulted in giving this office information of the alleged occurrence of 20 outbreaks of diphtheria, 20 outbreaks of scarlet fever, 31 outbreaks of typhoid and typho-malarial fever, and 3 outbreaks of measles. To what extent the reports of these alleged outbreaks were verified, is shown in the accompanying table.

TABLE 1.—*Showing the number of Outbreaks of Diphtheria, Scarlet fever, Typhoid fever and Measles, from October 1 to December 31, 1890, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, information concerning which was received through the Newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of newspaper reports which were denied by the health officer, and the per cent of newspaper reports in regard to which no reply was received from the health officer.*

Diseases.	Reports from *all* sources, October 1 to December 31, 1890.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria	108	19	45	25	30
Scarlet fever	144	14	45	15	40
Typhoid fever	102	30	29	26	45
Measles	27	11	33	33	33
Averages for the four diseases	....	19	38	25	37

HEALTH IN MICHIGAN IN THE FOURTH QUARTER OF 1890.

Communicable Diseases.

Compared with the preceding quarter (July, August and September, 1890), reports from all sources show *diphtheria* to have increased by an average of *eleven* places, *scarlet fever* to have increased by an average of *thirty* places, *typhoid fever* to have increased by an average of *eight* places, and *measles* to have decreased by an average of *thirteen* places.

Meteorology, and Sickness from all Causes, Compared with the Preceding Quarter.

A comparison of meteorological conditions of the fourth quarter of 1890, with the meteorological conditions of the preceding quarter, shows the prevailing direction of the wind to have been the same (northwesterly), the velocity to have been much less, the temperature to have been much lower, the rainfall at Lansing to have been .89 of an inch more, the absolute humidity to have been much less, the relative humidity to have been slightly more, the day, and the night ozone to have been less and the hight of ground above the water in the well at Lansing, to have been three inches more in the fourth quarter of 1890.

Compared with the preceding quarter (July, August and September, 1890), the reports from regular observers show a marked increase of membranous croup, pneumonia, puerperal fever, influenza, scarlet fever, pleuritis, tonsillitis, bronchitis, diphtheria and inflammation of brain, and a marked decrease of cholera infantum, cholera morbus, dysentery, whooping-cough, diarrhea, measles and inflammation of bowels.

This Quarter Compared with the Average for the Four Years, 1886-1889.

A comparison of the meteorological conditions of the fourth quarter of 1890, with the average of corresponding quarters in the four years, 1886–1889, shows that in 1890, the prevailing direction of the wind was northwest (instead of southwest), the velocity was less, the temperature was slightly higher, the rain-fall at Lansing was .86 of an inch more, the absolute and the relative humidity were more, the day ozone was less, the night ozone was more and the hight of ground above the water in the well at Lansing was one inch more in the fourth quarter of 1890.

Compared with the average for the corresponding quarters in the four years, 1886–1889, the reports received from regular observers indicate that influenza was much more than usually prevalent, and that typho-malarial fever, measles, inflammation of bowels, cholera infantum and dysentery were less than usually prevalent in the fourth quarter of 1890.

SECRETARY'S QUARTERLY REPORT OF WORK IN THE OFFICE OF THE BOARD DURING THE QUARTER ENDING MARCH 31, 1891.

Dangerous Communicable Diseases.

The number of reports of outbreaks of dangerous communicable diseases in Michigan, received from all sources and filed, and the corresponding number concerning which action was taken by this office, during the quarter, are as follows: for diphtheria, 133; for scarlet fever, 194; for typhoid and typho-malarial fever, 52; for measles, 137. Total for the five diseases, 516. No small-pox was reported in Michigan.

The number of communications relative to dangerous communicable diseases, received and placed on file during the quarter, was 1,306.

Relative to dangerous communicable diseases, letters, written cards, and demands for weekly or final reports, on cards, or in the form of the circular letter, were sent out during the quarter, to the number of 1,374.

The "Final" reports of outbreaks received and filed during the quarter, were: for diphtheria, 88; scarlet fever, 115; typhoid and typho-malarial fever, 35; measles, 14. Total for the five diseases, 252.

During the quarter, the local columns of newspapers to the number of 2,187 have been looked over for reports of occurrence of communicable diseases. This has resulted in giving this office information of the alleged occurrence of 26 outbreaks of diphtheria, 31 outbreaks of scarlet fever, 17 outbreaks of typhoid and typho-malarial fever, and 29 outbreaks of measles. To what extent the reports of these alleged outbreaks were verified, is shown in the accompanying table.*

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* During the reading of this report of work in the office, some of the points were discussed, as follows:—

Prof. Fall asked—What do you call an "outbreak?"

Dr. Baker—In this State, we have considered that an "outbreak" includes:—All cases in a township, village, or small city, which occur at one time, or follow each other so that there is not more than sixty days between the final disinfection of the premises of the last case, and the occurrence of the next case;

TABLE 1.—*Showing the number of outbreaks of Diphtheria, Scarlet fever, Typhoid fever and Measles, from Jan. 1 to March 31, 1891, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, information concerning which was received through the Newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of newspaper reports which were denied by the health officer, and the per cent of newspaper reports in regard to which no reply was received from the health officer.*

DISEASES.	Reports from *all* sources. Jan 1-March 31, 1891.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were denied by the health officer.	Per cent of newspaper reports to which the health officer made no reply to notice sent from this office.
Diphtheria	183	20	43	38	19
Scarlet fever	194	16	28	26	52
Typhoid fever	52	33	24	47	29
Measles	137	21	49	14	38
Averages for the four diseases		23	35	31	35

During the quarter, a circular on "The prevention of small-pox,—Now is a good time to be vaccinated" has been prepared, 2,000 have been printed, and about 1,500 copies have been sent to health officers of cities and villages and to editors of newspapers in Michigan.

During the quarter, about the usual number of pamphlets on the restriction and prevention of the dangerous communicable diseases,—

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also all such subsequent cases in which the contagium can be clearly traced to some case in the outbreak

Dr. Hazlewood—In studying outbreaks, do you include such cities as Grand Rapids, Detroit, and Saginaw?

Dr. Baker—Heretofore the two large cities, Detroit and Grand Rapids have not been, and could not be included, so far as relates to diphtheria and scarlet fever, because those diseases have been continuously present all the time,—there has been only one great and continuous outbreak.

Prof. Fall—Do you not sometimes count newspaper reports and health officers' reports of the same outbreak, and thus call what is really one outbreak two outbreaks?

Dr. Baker—No. The clerk in charge of that work keeps a book of record for each dangerous communicable disease, the book being ruled in columns so as to show at a glance the sources of information.

Prof. Fall—Is the activity of the health officers in Michigan more or less than last year?

Dr. Baker—The evidence indicates that the health officers are more active than they were last year; thus, for the four diseases—diphtheria, scarlet fever, typhoid fever and measles—knowledge was first obtained from the newspapers concerning about 19 per cent more of the whole number of outbreaks during the first quarter of last year than was the case during the first quarter of this year. This means that a much greater proportion of the outbreaks this year are being reported by the health officers themselves. There is still room for improvement, however, because, as is shown by the third column in Table 1, 23 per cent of all reports of the four dangerous communicable diseases during the last quarter of 1891, were obtained from the newspapers. Only about 35 per cent of those newspaper reports were verified and reported by the health officers.

So far as relates to the total number of reports of outbreaks of the several dangerous diseases. one year cannot yet be accurately compared with another, because although that may depend somewhat upon the activity of the health officers, it also depends on the comparative actual prevalence of each disease. This is governed somewhat by the season of the year, because diphtheria and scarlet fever increase during the cold season of the year, and small-pox increases following the cold seasons of the year, while typhoid fever increases in the autumn months, being most prevalent in October, and is least prevalent in April and May.

diphtheria, scarlet fever, typhoid fever, and measles, have been sent to localities where outbreaks of those diseases were reported.

ANNUAL REPORTS BY LOCAL OFFICERS.

A circular asking for annual reports for the year 1890, and blanks for the same, were sent to about 1,515 health officers, and about 1,515 clerks of cities, villages and townships; and, in return, 647 annual reports have been received from health officers, and 609 have been received from clerks, and these 1,256 annual reports have been filed.

Blanks for returns concerning medical practitioners were sent to 1,515 clerks of cities, villages and townships; and 346 have been filled out, returned to this office and filed.

SANITARY CONVENTIONS.

During the quarter, two successful sanitary conventions have been held,—one at Centreville, January 15 and 16, and one at Niles, February 5 and 6. Programs were prepared for each of these conventions, and copies of each were printed and distributed. At the Centreville convention about 100 sets of several pamphlets and diagrams, issued by this board, relative to the restriction of dangerous communicable diseases, and about 120 copies of pamphlet proceedings of former conventions were distributed; and at the Niles convention, about 200 sets of the pamphlets and diagrams relative to dangerous diseases, and about 120 copies of proceedings of former conventions were distributed.

Copies of the Public Health Laws, in force in Michigan, in 1890, and copies of pamphlet proceedings of the sanitary conventions at Battle Creek, and at Lapeer have been sent to about 270 health officers of cities and villages, and to about 150 journals, exchanges, and meteorological observers.

Copies of the proceedings of the Lapeer, and of the Battle Creek sanitary conventions have been sent to about 42 secretaries of State medical societies, in exchange for the transactions of those societies.

The proceedings of the Lapeer sanitary convention, and the Public Health Laws have been sent to about 90 libraries.

To the president, vice-presidents, committees and all who took part at the Lapeer sanitary convention, about 500 copies of the proceedings of that convention were sent, in compliance with their requests.

About 500 copies of the proceedings of the Battle Creek sanitary convention were sent to those who took part at that convention, and desired to have the published proceedings.

The proceedings of the Lapeer sanitary convention was sent to about 100 health officials and others, in other States, in exchange for their publications.

Papers, addresses, discussions and accounts of proceedings at the Alpena sanitary convention have been edited, and the pamphlet is nearly printed.

The editing of the proceedings of the Charlevoix and Niles conventions has been commenced.

The papers for the sanitary convention at Centreville have not been received from the secretary of that convention. He has been requested to send them in for publication.

DISTRIBUTION OF DOCUMENTS.

During the quarter, the number of annual reports sent to officers, sanitarians and others in this and other States, has been rather less than usual, because of the delay in getting out the annual report. Of the other publications, about the usual numbers have been sent out.

The pamphlet "Public Health Laws" and slip "Recent Saving of life in Michigan" were distributed to 154 members of the legislature, and newspaper reporters.

Copies of three pamphlet publications of this Board on the subject of the use of alcoholic drinks, one on the "Relations of the State to the Public Health" by Hon. Cyrus G. Luce, also a copy of the "List of Publications" of this Board, "which may be had on application" were sent to the presidents, vice-presidents, and secretaries of the State "Women's Christian Temperance Union," and to the presidents, vice-presidents, and secretaries of all local organizations of the W. C. T. U. in this State,—856 persons in all.

MISCELLANEOUS.

During the quarter, 96 books and pamphlets have been added to the library of the Board; also 119 journals as follows: Weeklies 75, semi-monthlies 12, monthlies 24, quarterlies 8.

During the quarter, 993 pages of the letter-copying books have been used in copying correspondence of the Office.

During the quarter, 4,202 pages of hektograph and mimeograph work were done.

The compilation of the article on Alleged Nuisances in Michigan in 1889, was nearly completed.

The compilation of reports relative to diphtheria in Michigan in 1889 was commenced, and is well under way.

During the quarter, 131 journals have been arranged for binding, and about 150 more journals have been arranged and tied, so that as soon as lacking numbers are supplied, they also can be bound.

Work on the card catalogue of the library has been continued.

REPORT OF WORK DONE IN METEOROLOGY DURING THE QUARTER ENDING MARCH 31 1891.

The weekly and monthly summary of meteorological conditions at Lansing, have been made, and a copy of the monthly summary sent each month, to the Chief Signal Officer, at Washington, D. C.

Monthly meteorological registers have been received, examined and filed from each of twenty-two stations, for the months of January and February, 1891.

Compilations have been made, by months, of the average temperature, absolute and relative humidity, per cent of cloudiness, direction of the wind, day and night ozone, and depth of rainfall, for the first eleven months of 1890, at 20 stations.

Seven diagrams have been made for purposes of study, and with the view to publication, as follows:—

1. Temperature and sickness from small-pox in Michigan, by months, for the 12 years, 1877–88.

2. Temperature and reported deaths per 100,000 inhabitants, from pneumonia and pleuro-pneumonia in Michigan, per year, for each of the 22 years, 1868–89.

3. Rainfall and reported deaths per 100,000 inhabitants, from typhoid fever in Michigan, per year for each of the 22 years, 1868–89.

4. Low water in wells and reported deaths, per 100,000 inhabitants, from typhoid fever in Michigan, per year, for each of the 10 years, 1880–89.

5. Reported sickness and deaths from typhoid fever in Michigan, per year, for each of the 4 years, 1885–88.

6. Reported sickness and deaths from typhoid fever in Michigan, per year, for each of the 8 years, 1877–84.

7. Reported sickness and deaths from typhoid fever in Michigan, per year, for each of the 12 years, 1877–88. This and the two preceding diagrams permit of interesting and valuable comparisons of the statistics of deaths, published by the Secretary of State, with statistics of sickness reported to the State Board of Health. The result is very satisfactory, because there is conclusive evidence of the usefulness of both series of statistics; and because they yield valuable evidence on the causation of an important disease.

REPORT OF WORK IN CONNECTION WITH SICKNESS STATISTICS.

During the first quarter of 1891, 1,675 postal-card blanks, and 53 blank record books were sent to 133 health officers and regular correspondents; the weekly card reports received were entered and compiled; 42 copies of the hektographed weekly bulletin, "Health in Michigan," were mailed each week, 94 copies of the monthly bulletin, "Health in Michigan," and 136 copies of the diagram of "Comparative Sickness," have been hektographed and mailed each month.

These bulletins have also been consolidated for the quarterly report, made today. Work has been done on the compilation of the weekly card reports of sickness, for the annual report.

HEALTH IN MICHIGAN IN THE FIRST QUARTER OF 1891. COMMUNICABLE DISEASES.

Compared with the preceding quarter (October, November and December), reports from all sources show *diphtheria* to have increased by an average of *three* places per month, *scarlet fever* to have increased by an average of *nine* places per month, *typhoid fever* to have decreased by an average of *thirty-two* places per month and *measles* to have increased by an average of *fifty-one* places per month.

METEOROLOGY,* AND SICKNESS FROM ALL CAUSES, FIRST QUARTER OF 1891, COMPARED WITH THE PRECEDING QUARTER.

A comparison of meteorological conditions* of the first quarter of 1891, with the meteorological conditions of the preceding quarter, shows the prevailing wind to have been from about the same direction, the average velocity to have been fourteen per cent greater, the temperature to have been lower, the absolute humidity to have been less, the relative humidity to have been slightly more, the day ozone and the night ozone to have been more, the rainfall at Lansing to have been 2.74 inches less, and the depth of ground above the water in the well at Lansing to have been seven inches more, in the first quarter of 1891.

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* [Footnote is on page followնig this.]

Compared with the preceding quarter (October, November and December, 1890), the reports from regular observers show a marked increase of measles, membranous croup, pleuritis, inflammation of brain, influenza, and cerebro-spinal meningitis, and a marked decrease of cholera infantum, typhoid fever (enteric), dysentery, cholera morbus, diphtheria and typho-malarial fever, in the first quarter of 1891.

FIRST QUARTER OF 1891, COMPARED WITH THE AVERAGE FOR THE FIVE YEARS, 1886-1890.

A comparison of the meteorological conditions[*] of the first quarter of 1891, with the average for the first quarters in the five years, 1886–1890, shows that in 1891, the temperature was higher,[†] the absolute humidity was slightly more, the relative humidity was about the same, the average velocity of the wind was nearly the same,[‡] the day ozone and the night ozone were more. (For the months of January and February, 1891, the day ozone was more, and the night ozone was considerably more. In March, 1891, the day ozone was about the same, and the night ozone was considerably more than for the average for the month of March in the five years, 1886–1890.) In the first quarter of 1891, the rainfall at Lansing was .19 of an inch less than for the corresponding quarters in the five years 1886–1890, and the depth of ground above the water in the well at Lansing was ten inches more than in the corresponding quarters in the five years 1886–1890. Compared with the average in the corresponding quarters in the five years 1886–1890, the reports received from regular observers indicate that membranous croup, cholera morbus, inflammation of brain, influenza, and cerebro-spinal meningitis were more prevalent, and that small-pox, whooping-cough, typho-malarial fever and diphtheria were less than usually prevalent in the first quarter of 1891.

THE CAUSATION OF INFLUENZA. SOMETIMES CALLED BY ITS FRENCH NAME, "LA GRIPPE."

Considering the fact of the unusual amount of ozone[*] during the first quarter of 1891, and of the unusual direction of the wind[*] in February, and the unprecedented direction of the wind in March,[*] together with the great increase and unprecedented occurrence of influenza throughout the State during the last three weeks of January, and the months of February and March, the following paragraphs supply evidence which seems to be very important:—

January:—For January, during the twelve years 1879–90, the prevailing direction of the wind (that is the direction from which the wind blew more times than from any other single point of the compass) was southwest, and for January, 1891, the prevailing direction of wind[*] was southwest. But for the week ending January 17, 1891, the prevailing direction of the wind was north, and northeast, an equal number of times from those two points.

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[*] These statements of meteorological conditions are from observations at Lansing only; but, heretofore, such observations, at the central station, have been found to supply a tolerably fair average of those for the State. For the Annual Report, it will be possible to study results of observations at several stations in Michigan. Sergeant Conger, Director of the Michigan State Weather Service, publishes in the "Monthly Report of the Michigan Weather Service," the average temperature, throughout the State, as higher in January and February, and slightly lower in March, 1891, than for the corresponding months in the preceding fifteen years, the average prevailing wind, for the State, for January, 1891, (42 stations) as southwest, for February (48 stations), west, and for March (39 stations), northeast.

[†] Higher in January and February, and slightly lower in March.

[‡] The direction of the wind is stated in paragraphs following this.

For the entire month of January, 1891, the night ozone increased but very slightly over the preceding month, and was 35 per cent above the average for January in the five years 1886–90. For the week ending January 17, the night ozone was 80 per cent above the average for the month of January in the five years 1886–90; and 329 per cent over the preceding week.

For the entire month of January, 1891, influenza increased ten per cent over the preceding month, and was 38 per cent above the average for the month of January in the five years 1886–90.

A marked increase of influenza in Michigan was first shown by the sickness reports for the week ending January 17, being an increase of 18 per cent over the preceding week, and 44 per cent above the average for the month of January in the five years 1886–90.

February:—For February in the twelve years 1879–1890, the point of the compass from which the wind blew the most times was southwest; but for February 1891, it was *northwest.*[*]

For February, 1891, the night ozone increased 16 per cent over the preceding month, and was 27 per cent above the average for February in the five years 1886–90.

For February, 1891, influenza increased in prevalence eight per cent over the preceding month. It was 37 per cent above the average for February in the five years 1886–90; and for February, 1891, was the first time in the history of the health statistics of Michigan that influenza was the most prevalent disease reported throughout an entire month.

March:—For March in the twelve years 1879–90, the point of the compass from which the wind blew the most times was northwest; but for March 1891, it was *north,* and next to that *easterly.* During the thirteen-year period (1879 to 1891 inclusive), March 1891, is the first March in which the wind is recorded as having been from the north and east more times than from any other point of the compass.

For March 1891, the night ozone was 24 per cent more than the average for March in the five years 1886–90.

For March 1891, influenza continued to be the most prevalent disease reported. It was 41 per cent above the average for March in the five years 1886–90.

DISCUSSION OF THE SUBJECT OF THE CAUSATION OF INFLUENZA AND THE OTHER COLD-WEATHER DISEASES.

In presenting the important evidence obtained in the office of the State Board of Health during the first quarter of 1891, bearing upon the causation of influenza and the other cold-weather diseases, the Secretary of the board spoke at some length, and the subject was discussed by other members of the board.

Dr. Baker remarked that epidemic influenza is justly considered with apprehension, because of the fact that many of the most important diseases, in this climate, are increased as influenza increases, some of them increasing coincidently with influenza, others following influenza a month or two later. Thus it is well known that pneumonia is markedly increased by the conditions which exist when influenza is increased. Thus in Chicago recently the total mortality rate has been doubled coincidently with the occurrence of influenza, and a large part of the mortality was from pneumonia. Pneumonia is one of the diseases which cause most deaths in Michigan, standing third on the list, during the twelve years 1876–87. Consumption is the disease which causes most deaths in Michigan; and consumption is one of the diseases which increases after influenza increases. Diphtheria has, during the twelve years, 1876–87, caused next most deaths in Michigan; and, in Michigan, diphtheria has seemed to increase under such conditions as those when influenza increases. Scarlet fever has stood fifth on the list of diseases causing most deaths in Michigan, and scarlet fever has increased under those conditions. Small-pox has been rare in Michigan, but that disease has followed influenza.

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[*] See footnote on page lv.

It will be noticed that the diseases which, by the sickness statistics of Michigan, have been proved to increase with or following influenza, belong to a class concerning which propositions can be made, as follows:—

1. Diseases which are most prevalent during or following the cold seasons of the year.

2. Diseases which are known to be caused by micro-organisms or "specific" causes. Among the diseases the specific causes of which are well known to pathologists, and have been propagated outside the body by many investigators are consumption, pneumonia and diphtheria; while scarlet fever and small-pox are known to be due to specific causes, which it has been claimed have been isolated and cultivated, but which claims are not yet verified. Professional and non-professional people generally, however, accept the fact that those diseases are propagated, the specific cause of each case being derived from a pre-existing case.

3. Diseases which, as a rule, are believed to enter the human body by way of the throat or air passages.

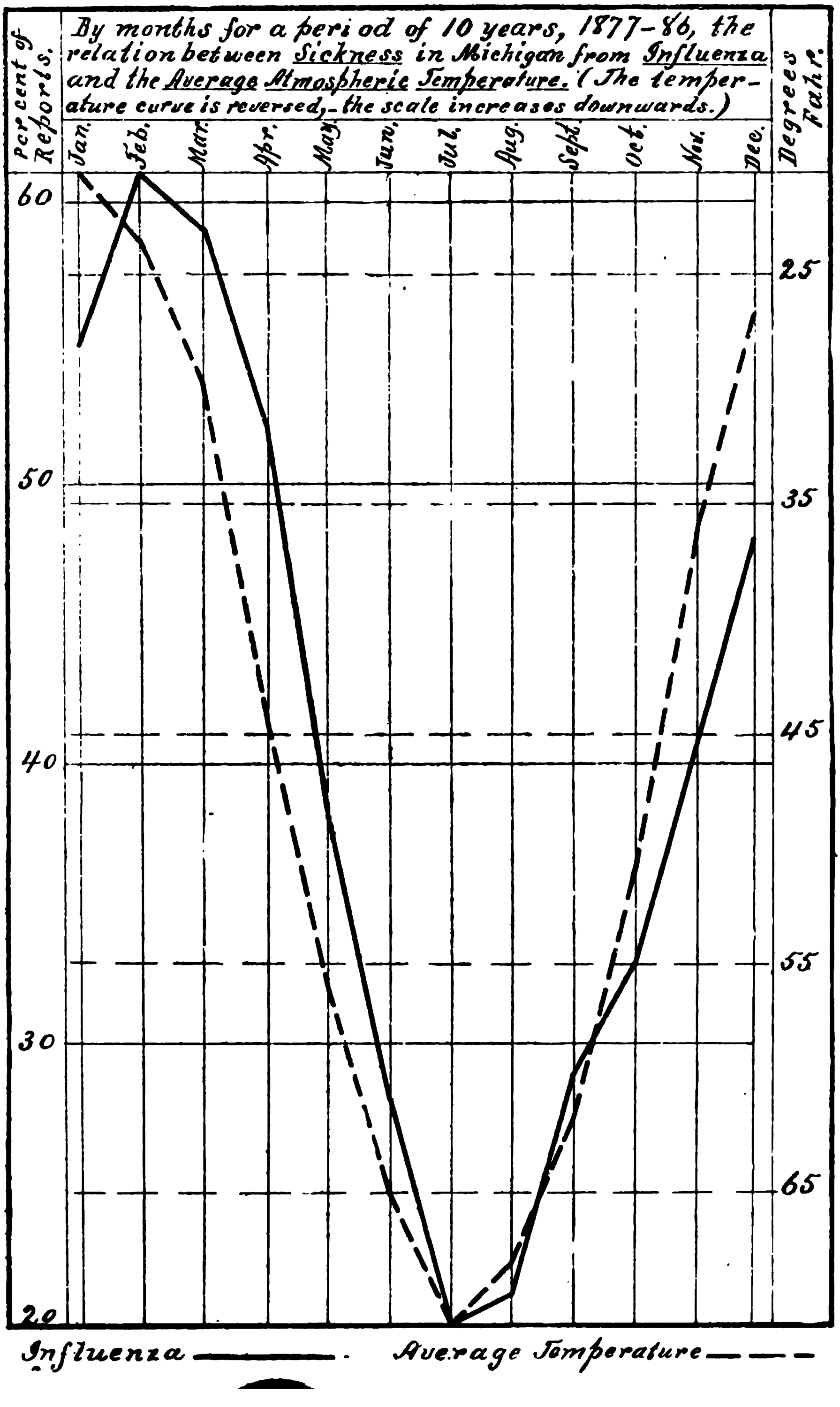
According to the evidence which for many years, has been accumulating in the sickness statistics of Michigan, influenza belongs in the class of diseases concerning which the foregoing three propositions are true.

Absolute proof of the truth of the proposition No. 1, relative to influenza, is given herewith in the Diagram No. 1, on page lviii.

Proposition No. 3 is so obvious concerning influenza that no further proof is required, and none is here offered.

Concerning proposition No. 2, it would seem that the evidence is now sufficient relative to influenza; but few people have had opportunity to study a summary of the evidences; and it may be that influenza should be included, with scarlet fever, among the specific diseases for which the specific cause has not with certainty been isolated. This subject, however, is referred to further on. At this meeting, only a bare outline of the evidence was presented, partly because members of the Board were supposed to hold in mind much that was not mentioned. Dr. Baker referred to the fact that it is now considered established that, as a rule, inflammations are due to micro-organisms, that the cause of ordinary pus ("matter" as it is commonly called) is "specific," that is, a living micro-organism—the *staphylococcus*, and *streptococcus pyogenes*, that all the bacteriologists who have reported results of examinations for micro-organisms in influenza have reported the finding of these pus-generating micro-organisms; as, for instance, Rikert, in Bonn (*Deutsche Medicinische Wochenschrift*, Jan. 23, 1890), in a bacteriological study of five cases of influenza, found the only species constantly present was the *streptococcus pyogenes*. While most of the investigators have assumed that these common pus-generating micro-organisms could not be the specific cause of influenza, because they

DIAGRAM No. 1.—*Temperature and sickness from Influenza in Michigan.*



are so uniformly present, Rikert suggested that the *streptococcus*, "in association with some unknown peculiar atmospheric condition, may cause the disease."*

This conclusion by Rikert is the same as was reached in the paper read, by the secretary of this board, at the meeting of the American Medical Association in Nashville, Tenn., in May, 1890, but which paper is not yet published. In that paper it was shown that influenza is present in Michigan in every month of every year; its specific cause, if it have one, must, therefore, be a very common one, present in Michigan all the time. The *streptococcus pyogenes* is a well-known cause of inflammation, and it is such an ever-present specific cause as the circumstances of the case require.

In the paper by the secretary of this board, referred to in a preceding paragraph, it was shown that throughout about all recorded epidemics of influenza in past times the chief coincident meteorological conditions had been cold winds, or winds from an unusual direction. It was shown that the great epidemic of 1890, which began in St. Petersburg, followed closely the occurrence of northeast winds at a season of the year when the winds were usually from the south and west. The long-continued northeast winds at St. Petersburg came from the direction of the cold regions of northern Siberia.

Previous to the preparation of the paper just mentioned, the sickness statistics of Michigan have proved, beyond question, that in a long series of years, and as a rule, influenza sustains quantitative relations to the temperature of the atmosphere, the influenza increasing after exposure to a falling temperature of the atmosphere, and decreasing after a rising temperature of the atmosphere. This is demonstrated by the diagram printed herewith, page lviii.

It has previously been noticed, however, that the great epidemics of influenza occur, in many instances in years when the weather, for the season of the year, has been warmer than is usual. And, during the occurrence of epidemics of influenza, it has been observed that the atmosphere has, to say the least, not been colder than usual at that season of the year. This discrepancy apparent in the evidence has not, it is believed, been so fully explained until the paper by the secretary of this board, in May last. How the wind might tend to cause influenza, was also suggested. The rapidly cooling effect of wind, especially when evaporating moisture, is well known.

The influence of wind in producing dryness, of all surfaces which it reaches is well understood by all who have observed its drying effects upon washed clothes hung out to dry, which will dry in comparatively wet weather if there is wind. Yet very few persons appreciate the fact, which is made apparent in this office by a close study of meteorological data, that the relative humidity of the atmosphere is usually much reduced by the prevalence of wind. The effects of atmospheric dryness, however induced, upon the delicate mucous membranes lining the nose, throat and other air passages, has, for many years, been made the subject of careful study, by the secretary of this Board, and the results of that study have been published by him in numerous papers, among which are those in the annual reports of this Board.*

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* American Lancet, April, 1890, p. 159.

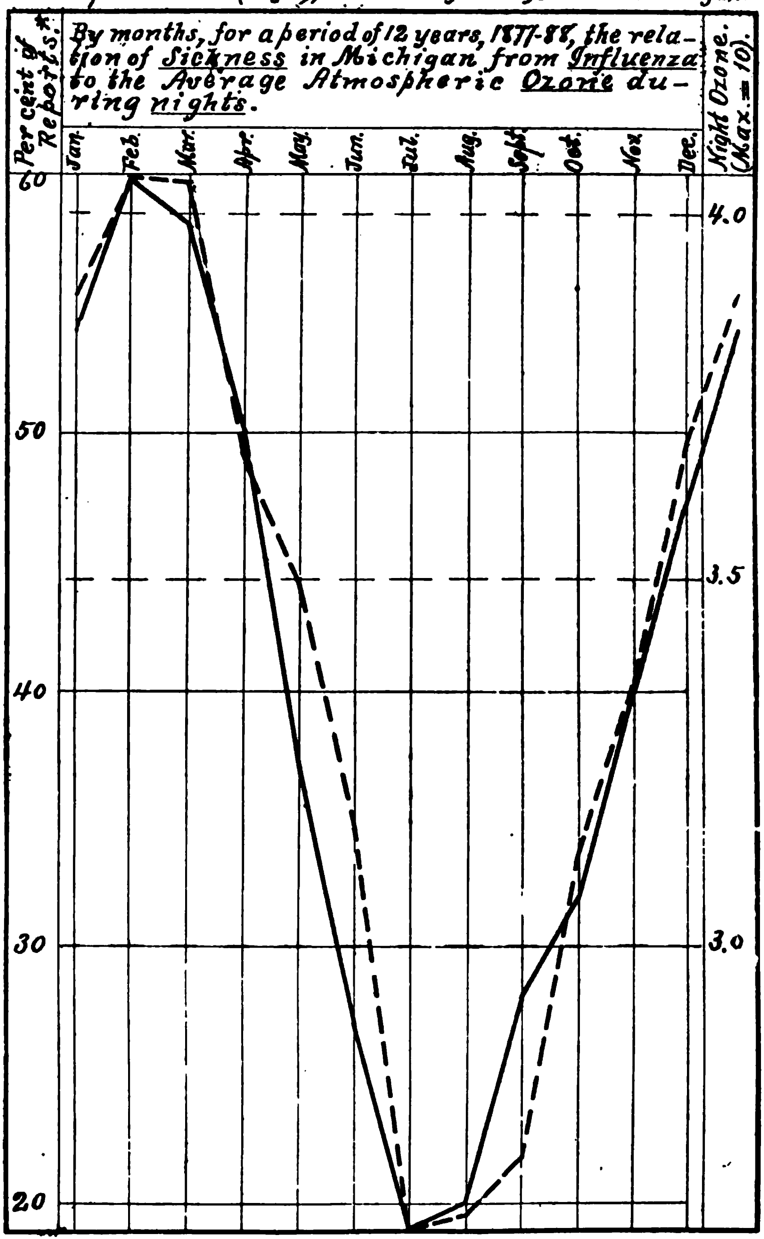
* The principal papers on this subject are: "The causation of pneumonia," Annual Report Michigan State Board of Health, for the year 1886. (This article was reprinted in pamphlet form being reprint No. 268.) "The causation of cold-weather diseases." Annual Report Michigan State Board of Health, for the year 1887. (This article was reprinted in pamphlet form, being reprint No. 282.) And, "Relations of certain meteorological conditions to diseases of the lungs and air-passages as shown by statistical and other evidence," Annual Report Michigan State Board of Health, for the year 1888. (This article was reprinted in pamphlet form being reprint No. 290.)

The evidence of the observations of sickness in Michigan, and of the meteorological conditions during the first quarter of 1891, confirms the previous conclusions to such an extent as to leave little, if any, room for doubt as to the causal relation of cold wind, and wind from an unusual direction, to influenza. It also supplies information relative to the influence of ozone, in the causation of influenza, which seems to be exceedingly important, for several reasons, one being that in nature the opportunity to study the influence of ozone apart from the influence of cold does not often occur. It has long been apparent from the statistics in Michigan, that the relation of ozone to influenza, and to other diseases of the air-passages and lungs, was close; thus in the Annual Report of this Board for 1888, on page 148, it is stated that "the curve for the rise and fall of atmospheric ozone is, in Michigan at least, almost precisely the curve for the rise and fall of pneumonia." And, Dr. Henry Day, of London, England, claimed several years ago, that his experiments with dogs proved that the inhalation of ozone caused bronchitis, and in larger quantities, pneumonia. But, ordinarily, the residual ozone in the atmosphere is so nearly dependent upon the temperature of the atmosphere, that it has been difficult to separately estimate the influence due to each element. As a rule, in a long series of years, influenza is not more closely related to a cold atmosphere than to ozone, as is shown by comparing the two diagrams, on pages lviii, lxi of this Report. The evidence during the last quarter, however, is such as to permit of this separate study, and it seems to leave no doubt that in the causation of influenza, and probably also of the other diseases of the air-passages and lungs, and of the diseases which enter by those surfaces, ozone is at times more powerful than a cold atmosphere, and the evidence, therefore, indicates that at all times when these diseases are apparently caused by cold atmosphere, ozone is probably one important factor in the causation.

The relation which atmospheric ozone bears to influenza, as a general rule, as is proved by statistics for a series of years, is shown in the diagram on page lxi. It is possible that if the method of measuring ozone were as perfect as that for measuring temperature, a more steady curve would be found to represent the ozone; but the diagram shows that the curve is not very irregular, and that it bears a very close relation to that representing influenza.

At this meeting of the board, the nature of ozone, and of its action upon the human air-passages, was discussed by Prof. Fall, and by Dr. Baker. Ozone is oxygen in a more active form than ordinary oxygen. It is believed that ozone is oxygen the atoms being so grouped that each molecule consists of a group of three atoms. Its action on the air-passages is very much like that of chlorine gas, although its odor is not so unpleasant as chlorine. In concentrated form, it is exceedingly irritating to the air-passages. In a recent publication it is stated that "All investigators concede that ozone in condensed form irritates the mucous membrane of the organs of respiration, and produces, according to its density and time of administration, active inflammation, salivation, bloody expectorations and death. Binz found also œdema of the lungs in animals killed by ozone inhalations, but he claimed that the irritative effects were not as severe as those produced by chlorine, bromine or iodine." It being proved, however, that, if present in sufficient quantity, it is capable of causing immediate death, evidence as to its presence in the atmosphere is important, and it is especially important, when we have, as in the diagram on the following page, positive and con-

Atmospheric Ozone (Night), and Sickness from Influenza in Michigan.



Influenza ——————. Average Night Ozone — — —.

*Which stated that Influenza was under the observation of the physicians who made reports.

clusive evidence that in Michigan, the atmospheric ozone sustains constant and quantitative relations to the sickness from influenza, influenza increasing when the ozone increases, and decreasing when the ozone decreases. It is known that the micro-organisms which cause pneumonia, are (not very infrequently) present in the mouths and air-passages of persons who do not have pneumonia. Experiments have proved that exposure to cold alone is not sufficient to cause pneumonia; and that exposure to cold and coincident inoculation with the "germs" of the disease do cause pneumonia.

The increase of pneumonia at such times as people are exposed to an atmosphere which is cold, and which thus depresses the resisting power of the part exposed to the germs of the disease, at such times as the atmosphere contains the irritant ozone, is easily understood. The three important factors seem to be, (1) the microscopic specific cause of the disease, (2) the irritant ozone which, by the increased exudation of nutritive fluids which it causes, favors the reproduction of the specific cause, (3) the depressing action of the cold which lessens the resisting power of the exposed surface. This last influence is better appreciated if one holds in mind the experiments by Pasteur when he caused fowls, which ordinarily do not contract anthrax, to contract the disease by inoculating them with the germs of anthrax, and lowering their temperature by causing them to stand in cold water.

During the discussion, Dr. Hazlewood asked Dr. Baker "Are there not more than three factors in the causation of specific diseases?"

Dr. Baker replied, yes. The three prominent ones I have just mentioned, and the one mentioned, a few minutes since by Dr. Avery,—the condition of the blood. But it now seems that the theory put forth by Metchnikoff that the white corpuscles of the blood are phagocytes, and destroy the germs of disease,—must be modified so as to consider that the condition of the blood serum — more especially the albuminous constituents of the blood, is of most consequence, the life of many of the micro-organisms which cause disease being destroyed by the albuminous portion of the blood, when that is in its best condition.

Dr. Hazlewood—"A weak solution of sugar, hermetically sealed, will remain sweet for years, but when opened, and exposed to the access of germs, will spoil. Will not the same principle apply to the human system and to these specific diseases?"

Dr. Baker—"Yes, I think so. Of certain diseases, enough germs put into the system of any person will cause the disease. Probably that is true of pneumonia; yet, under all ordinary circumstances, the amount of pneumonia is absolutely controlled by the atmospheric conditions, as is proved by the statistics in Michigan, and as has been demonstrated by the diagrams which have been carefully constructed from those statistics, and which have been published in the annual reports of this board.*"

THE PREVENTION OF SPECIFIC DISEASES.

Dr. Hazlewood to Dr. Baker—"Do you believe that there is any consumption without the tubercle bacilli?"

Dr. Baker—"Leading pathologists say there is not; and I believe they are right."

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* Pages 252, 286 Report for 1886, pages 155, 166, Report for 1888.

This, of course, bears upon the subject of the prevention of specific diseases, many of which are controlled by atmospheric conditions. Much can be done to avoid exposures to atmospheric conditions, but if the specific causes are not present the disease does not occur. And there are many things which can be done to lessen the presence of the specific causes of diseases, as has been demonstrated in Michigan within the past few years. Consumption is the one which now causes most deaths in Michigan — and this Board has published methods which, if generally observed, as it is hoped they may be, would go far toward entirely doing away with the specific cause of that disease in this State. For the prevention of pneumonia, methods similar to those recommended for the prevention of consumption would undoubtedly be useful. For the prevention of influenza, and the numerous other important diseases which accompany or follow it, similar methods would probably be useful; but the ordinary micro-organisms which cause inflammations are exceedingly generally disseminated, in all thickly-settled places. Much could be done to lessen them through improved systems of ventilation of residences and public buildings; and much through more care for the destruction of all sputa, and for the disinfection of all handkerchiefs, more care in sweeping and dusting, and in the beating of carpets.

For further suggestion of effort for lessening all inflammatory diseases, Dr. Baker referred to his address on " Sanitation in 1890," in which occurs a paragraph as follows: " Since nearly all suppurative inflammations are breeding-places for micro-organisms which, when they gain entrance into another living body (or into another weak or injured spot in the same body), are capable of again starting the inflammatory process, therefore, *should not all purulent discharges, and all pus which is accessible, be destroyed or disinfected?* Should not the aim be thus to restrict the spread, and eventually to stamp out all inflammations?"*

At this meeting of the Board, Dr. Baker mentioned the fact that whereas on a free surface the common pus-generating micro-organisms cause simply inflammation, with what was formerly known as "laudable " pus, the inflammation sometimes leads to pain, as is the case in boils; that whereas inoculation of the healthy human or animal body with these micro-organisms sometimes leads to no result, and a fracture of a bone in the healthy human or animal body frequently is followed by immediate recovery, yet inoculation with these micro-organisms and the coincident fracture of a bone causes osteo-myelitis; that in osteo-myelitis the pus contains the pus-generating micro-organisms, and when pus from that source is rubbed into the skin, it causes boils. Thus that circle of causation is complete.

Cerebro-spinal meningitis is another disease which seems to belong in this same class (mentioned first on page lvii).

Rheumatism is another disease which, in Michigan, causes much sickness. That, so far as it is an inflammatory disease, it belongs in the same class with these other diseases, which have been mentioned, is proved by the sickness statistics of Michigan, in connection with what is known to pathologists and bacteriologists. These same pus-generating micro-organisms have been found in the inflamed areas in rheumatisms. How closely rheumatism is associated with influenza is indicated by the weekly and monthly bulletins of "Health in Michigan" during the first quarter of

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* Page 15, of "Sanitation in 1890." Being the address of the president of the American Public Health Association, at Charleston, S. C., Dec. 16, 1890.

1891. A portion of one of these bulletins is shown herewith. It is printed on this page.

HEALTH IN MICHIGAN.—*Reports to the State Board of Health, Lansing, by observers in different parts of the State, show the diseases which caused most sickness in Michigan during the week ending April 18, 1891, as follows:—*

Number of regular observers heard from, 54.		For preceding week.
Diseases arranged in order of greatest area of prevalence.	Per cent of Observers who reported the disease present.	Per cent of Observers who reported the disease present.
Influenza	96	98
Rheumatism	80	77
Bronchitis	72	75
Neuralgia	71	73
Tonsillitis	59	63
Consumption of lungs	57	60
Pneumonia	44	46
Intermittent fever	39	25
Measles	31	31
Pleuritis	30	29
Diarrhea	26	19
Remittent fever	25	13
Inflammation of kidney	17	8
Erysipelas	17	21
Scarlet fever	9	10
Inflammation of brain	7	2
Inflammation of bowels	6	13
Membranous croup	6	8
Typho-malarial fever	6	2
Cerebro-spinal meningitis	6	0
Diphtheria	4	0
Whooping cough	2	4
Typhoid fever (enteric)	2	4
Puerperal fever	0	4

It seems to be proved that pneumonia is generally caused by a lanceolate coccus, a micro-organism first discovered by Dr. Sternberg, in his own sputa, in 1880, though a form of pneumonia is, less frequently, caused by the so-called pneumo-coccus discovered by Friedländer. It seems to be proved that the causation of pneumonia is favored by whatever causes an inflammation of the bronchial tubes, and that, very generally, that inflammation is caused by the same pus-generating micro-organisms—the *staphylococci* and *streptococci pyogenes*, of which there are three varieties the *aureus*, *albus* and *citreous*. That these micro-organisms are uniformly present in influenza has been the uniform testimony of bacteriologists. There is, therefore, no difficulty in understanding how all the great and important class of diseases which generally enter the body by way of the throat or air-passages should be increased, as they are known to be, coincidently with, or following influenza. That some of them, like small-pox and consumption, follow later than the influenza, depends, apparently, upon the fact that in those diseases the period of incubation is longer than in some of the other diseases.

Dr. Baker remarked that we now have the facts to answer the question—"What are the diseases which cause the most deaths in Michigan?" We are now able to answer the question—"What are the conditions which prevail, when most of these dangerous diseases increase?"

The prevention of influenza, and of the coincident rise in some of the other more dangerous diseases, has not been possible, because some of the factors in their causation were unknown. Now the causes are known, and the study of the measures for their prevention can be proceeded with more intelligently.

That it is possible to prevent specific diseases which ordinarily increase when influenza increases, is proved by the facts now on record in Michigan. We know from the statistics in Michigan that in times past diphtheria and scarlet fever have been increased under atmospheric conditions, similar to those which prevailed when influenza increased; we also know from the statistics that, in recent years, the contagion of those two diseases has, in a great number of instances, been destroyed by systematic disinfection, that in Michigan these diseases have been greatly restricted. If nothing of this kind had occurred both of these diseases would now, according to experience in former times, be unusually prevalent. The fact is that both of these diseases were less prevalent, during the first quarter of 1891, than the average for a long series of years. In times past small-pox has, as a rule, increased in months following those in which influenza increased; yet thus far in this year it could not possibly increase from a local source because there has not been in Michigan any case, to supply the specific cause, from which it could spread. Of course the present time is recognized by the State Board of Health as one of danger of the spread of small-pox, if it should gain an entrance into the State, and this State Board has taken action, to warn every local board in the State; but the fact of the present complete immunity is here mentioned in order to demonstrate the possibility of the complete prevention of one of the most dangerous specific diseases, and one which, when preventive measures are not enforced, increases following influenza.

What has been done in Michigan in the case of diphtheria, scarlet fever, and small-pox, should encourage the people of Michigan to coöperate more thoroughly for the prevention of those diseases which now cause the most deaths in Michigan. The one which is the most dangerous of all—that is, which causes the most deaths—consumption, would seem to be about the easiest one to restrict. Some of the most important measures for its prevention have been pointed out by this Board.

In order to do the best work for the prevention of these diseases, the Board should have increased facilities. The work is immense. Its appropriations are small. It should be enabled to employ at least one expert to visit and aid localities in the proper measures for the restriction of these dangerous diseases.

SECRETARY'S QUARTERLY REPORT OF WORK IN THE OFFICE OF THE BOARD DURING THE QUARTER ENDING JUNE 30, 1891.

Dangerous Communicable Diseases.

The numbers of reports of outbreaks of dangerous communicable diseases in Michigan, received from all sources and filed, and the corresponding numbers concerning which action was taken by this office, during the quarter, are as follows: Reports of outbreaks of diphtheria, 96; of scarlet fever, 129; of typhoid and typho-malarial fever, 37; of measles, 118. Total reported outbreaks of the five diseases, 380. No small-pox was reported in Michigan.

The number of communications relative to dangerous communicable diseases, received and placed on file during the quarter, was 1,075.

Relative to dangerous communicable diseases, letters, written cards, and demands for weekly or final reports, on cards, or in the form of the circular letter, were sent out during the quarter, to the number of 1,235.

The "Final" reports of outbreaks received and filed during the quarter, were: of diphtheria, 59; scarlet fever, 84; typhoid and typho-malarial fever, 5; measles, 77. Total "Final" reports relative to the five diseases, 225.

During the quarter, the local columns of newspapers to the number of 2,206, have been looked over for reports of the occurrence of dangerous communicable diseases. This has resulted in giving this office information of the alleged occurrence of 12 outbreaks of diphtheria, 20 outbreaks of scarlet fever, 4 outbreaks of typhoid and typho-malarial fever, and 31 outbreaks of measles. To what extent the reports of these alleged outbreaks were verified, is shown in the accompanying table.*

TABLE 1.—*Showing the number of Outbreaks of Diphtheria, Scarlet fever, Typhoid fever and Measles, from April 1 to June 30, 1891, of which notice was received at the office of the Michigan State Board of Health; the per cent of reports, information concerning which was received through the Newspapers; the per cent of newspaper reports which were confirmed by the health officer; the per cent of newspaper reports which were denied by the health officer, and the per cent of newspaper reports in regard to which no reply was received from the health officer.*

Diseases.	Reports from *all* sources, April 1—June 30, 1891.	Per cent of all reports which were obtained from the newspapers.	Per cent of newspaper reports which were confirmed by the health officer.	Per cent of newspaper reports which were reported by the health officer to be incorrect.	Per cent of newspaper reports of which the health officer made no report in response to official request for facts.*
Diphtheria	96	13	42	0	58
Scarlet fever	129	16	40	5	55
Typhoid fever	37	11	25	25	50
Measles	118	26	52	13	35
Averages for the four Diseases	....	17	40	11	* 50

* It seems significant that of the outbreaks reported by newspapers so large a proportion is in jurisdictions where, because of disregard of law, there are no health officers, or where the health officers do not comply with the law which requires them to make such reports.

During the quarter, about the usual number of pamphlets on the restriction and prevention of the dangerous diseases—diphtheria, scarlet fever, typhoid fever, and measles—have been sent to localities where outbreaks of those diseases were reported.

ANNUAL REPORTS RECEIVED FROM LOCAL OFFICERS.

During the quarter ending June 30, 1891, there have been received and filed 23 annual reports from health officers and 17 annual reports from clerks for the year 1890, which added to those received during the preceding quarter makes the number of annual reports received from health officers 670, and the number received from clerks 626 for the year 1890.

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* An outbreak includes: All cases in a township, village or small city, which occur at one time, or follow each other so that there is not more than sixty days between the final disinfection of the premises of the last case, and the occurrence of the next case; also all such subsequent cases in which the contagium can be clearly traced to some case in the outbreak.

During the quarter ending June 30, 1891, 71 blanks concerning medical practitioners have been filled out and retured to this office and filed, which together with those received during the preceding quarter make 417 received during the six months ending June 30, 1891.

About the first of April, 1891, circulars and blank forms for the return of the name and address of the health officer for the ensuing fiscal year were sent to 1,854 local officers, as follows:—mayors and clerks of cities, presidents and clerks of villages, and supervisors of townships; also, about the first of June, a second demand was sent to about 700 clerks of cities, villages, and townships, who had not yet made returns. In response, the names and addresses of 51 health officers of cities, 183 health officers of villages, and 991 health officers of townships, 1,225 in all, have been received, and they have been entered on the books of this office. On June 30 there were 320 localities still delinquent, as follows: 16 cities, 89 villages, and 215 townships, out of a total of 67 cities, 272 villages, and 1,206 townships, or 1,545 localities in the State.

Proof has been read on the pamphlet, "Proceedings of the Sanitary Convention at Alpena," which has been printed.

The papers, addresses, discussions and accounts of the proceedings at the Charlevoix Sanitary Convention have been edited, and the proof has been read, the printing of the pamphlet having been completed.

The papers, addresses, discussions and accounts of the proceedings at the Niles Sanitary Convention have been edited, and sent to the State Printer for printing.

The papers and discussions at the Sanitary Convention at Centerville have nearly all been received, and the editing of the proceedings of the convention has been commenced.

The work on the card-catalogue of the library has been continued.

Of the eighty-six (86) different medical and sanitary journals received in this office in exchange for the publications of this Board, there have been received during the quarter three hundred and ninety-six (396) numbers.

DISTRIBUTION OF PUBLICATIONS DURING THE QUARTER.

About 1,000 copies of the Annual Report of this Board for the year 1889 were sent to the following:—members and ex-members of this Board, members of the Michigan Board of Corrections and Charities, Sanitary Journals, and exchanges, Secretaries of State Boards of Health, meteorological observers and exchanges, health officers of cities and villages, clerks of cities and villages, and mayors of cities.

About two hundred copies of each of the publications, "The Prevention of Small-Pox," "Now is a good time to be Vaccinated," "Abstract of the Proceedings of the Michigan State Board of Health—Annual Meeting April 14, 1891," and the "Proceedings and Addresses" at the Alpena Sanitary Convention, were sent to the following:—members and ex-members of this Board, sanitary journals and exchanges, meteorological observers and exchanges, Secretaries of State Boards of Health, and members of the Michigan Board of Corrections and Charities.

About two hundred and seventy-five copies each of the reprint of the paper, "Sewerage and Drainage," by A. Arnold Clark, and "Can Consumption be Prevented?" by William E. Ziegenfuss, M. D., were sent to the health officers of cities and villages.

About three hundred and eighty-five copies of The Prevention of Small-Pox were sent to clerks and presidents of cities and villages.

About two hundred and fifty copies of the Proceedings of the Alpena Sanitary Convention were sent to the presidents and vice-presidents, members of committees and all who took part at that convention.

Blanks for the registration of physicians were sent to about 1,190 supervisors of townships, and to about 301 supervisors or assessors of villages.

A copy of the Public-Health Laws, and a set of pamphlets telling how to restrict and prevent the several dangerous communicable diseases, were sent to 102 health officers of cities and clerks or presidents of city boards of health, to about 364 health officers of villages and clerks or presidents of village boards of health, and to 1,860 health officers, clerks and supervisors of townships, on receipt of the returns of the names of the health officers for 1891–92.

The weekly and monthly summary of meteorological conditions at this station have been made, and a copy of the monthly sent each month, to the chief signal officer at Washington, D. C., and, also, a copy to Sergt. N. B. Conger of the Michigan State Weather Service, Lansing, Michigan.

Tables showing, by year, and by months, the meteorological conditions at from 7 to 20 stations, have been made for the year 1890, as follows:—Average Temperature; Extremes and Range of Temperature; Average Daily Range of Temperature; Absolute Humidity; Relative Humidity; Cloudiness; Rainfall; Day Ozone; Night Ozone; Velocity of the Wind; and Atmospheric Pressure. Much of the text of the article on meteorology for 1890 is written. Meteorological registers from the voluntary observers at 18 stations in Michigan, for April and May, 1891, have been received, also some of the reports for June. The meteorological registers for January, 1891, from 18 stations, have been examined.

Photo-ink diagrams have been made and studied as follows:—

(1) The Relation of Sickness from Influenza in Michigan to the Average Night Ozone for a period of 10 years, 1879–88.

(2) The Relation of Sickness from Influenza in Michigan to the Average Night Ozone for a period of 12 years, 1877–88.

(3) The Relation of Sickness from Tonsillitis and Rheumatism to the Average Temperature, and the Relation of Rheumatism to Tonsillitis in Michigan, for a period of 10 years 1879–88.

(4) Pencil diagram,—Sickness in Michigan from Influenza, and the Average Night Ozone at Lansing.

REPORTS OF WORK IN CONNECTION WITH SICKNESS STATISTICS.

During the second quarter of 1891, 3,809 postal-card blanks, and 239 blank record-books were sent to 237 health officers and regular correspondents for making the weekly card reports of sickness; the weekly card reports received were entered and compiled; 42 copies of the hektograph weekly bulletin, "Health in Michigan," were mailed each week, and 95 copies of the monthly bulletin, "Health in Michigan," have been hektographed and mailed each month.

HEALTH IN MICHIGAN IN THE SECOND QUARTER OF 1891.

Communicable Diseases.

Compared with the preceding quarter (January, February and March), reports from all sources show *diphtheria* to have decreased by an average of *fifteen* places per month, *scarlet fever* to have decreased by an average of *twenty-two* places per month, *typhoid fever* to have decreased by an average of *eleven* places per months and *measles* to have increased by an average of fourteen places per month.

METEOROLOGY, AND SICKNESS FROM ALL CAUSES, SECOND QUARTER OF 1891, COMPARED WITH THE PRECEDING QUARTER.

A comparison of meteorological conditions of the second quarter of 1891, with the meteorological conditions of the preceding quarter, shows the prevailing wind to have been from the northeast (instead of westerly), the average velocity to have been 2.5 miles per hour less, the temperature much higher, the absolute humidity considerably more, the relative humidity slightly less, the day ozone and the night ozone more, the rainfall at Lansing 0.21 of an inch more, and the depth of water in the well at Lansing 8 inches greater in the second quarter of 1891.

Compared with the preceding quarter (January, February and March), the reports from regular observers showed a marked increase of cholera infantum, measles, dysentery, cholera morbus and whooping-cough, and a marked decrease of membranous croup, typho-malarial fever, inflammation of brain, typhoid fever, pneumonia and diphtheria, in the second quarter of 1891.

Second quarter of 1891, compared with the average for the five years, 1886–1890.

A comparison of the meteorological conditions of the second quarter of 1891, with the average for the second quarters in the five years 1886–90, shows that in 1891, the prevailing direction of the wind was from the northeast (instead of southwest), the velocity nearly the same, the temperature slightly higher, the absolute humidity and the relative humidity were less, the day ozone less, the night ozone more, the rainfall 0.55 of an inch less and the depth of the water in the well at Lansing to have been five inches less in the second quarter of 1891. Compared with the average in the corresponding quarters in the five years 1886–90, the reports received from regular observers indicate that typho-malarial fever, whooping-cough, diphtheria, puerperal fever, intermittent fever and typhoid fever were less prevalent, and influenza was much more than usually prevalent in the second quarter of 1891.

GENERAL REPORT OF WORK IN THE OFFICE OF THE SECRETARY OF THE STATE BOARD OF HEALTH DURING THE FISCAL YEAR ENDING JUNE 30, 1891.

Much of the work of the office naturally groups itself under three closely related heads,—the collection of information, the compilation and elaboration of information, and the dissemination of information. In the following outline that grouping is adhered to so far as is practicable without repetition.

COLLECTION AND COMPILATION OF INFORMATION.

SPECIAL REPORTS RELATIVE TO DANGEROUS COMMUNICABLE DISEASES.

Every health officer is supplied with blanks "L" from this office, for reporting outbreaks of diphtheria, typhoid fever, scarlet fever, small-pox, measles, etc., (dangerous communicable diseases) to the Secretary of the State Board of Health.

Upon the receipt of the report of an outbreak of such disease, blanks "M" for weekly reports during the outbreak, are sent, with a circular letter, ("Blue Letter"), also a number of pamphlets containing instructions for the suppression of the disease. These pamphlets are to be distributed to the neighbors of the family in which the disease is, in order to obtain their coöperation with the health officer.

About 1,669 outbreaks of such diseases were thus attended to during the fiscal year ending June 30, 1891.

Later a blank is sent to each such locality for a final report at the close of the outbreak, stating just what was done for the restriction of the disease, and with what result,—the number of cases and deaths, households invaded, what disinfectants were used, in what quantities, and other facts supplying important data for future efforts.

The facts thus collected are compiled for publication in the Annual Report of the Secretary of the State Board of Health. In this Annual Report will be found the report of such facts relative to the dangerous communicable diseases in Michigan during the year 1890. It is printed on pages 147-256.

SICKNESS STATISTICS; WEEKLY POSTAL-CARD REPORTS OF ALL IMPORTANT DISEASES IN 1890-91.

The weekly postal-card reports of diseases, sent on cards furnished by the State Board of Health, have been received from health officers of cities and villages and other leading physicians, who contribute this valuable information, from different parts of the State. The plan of these weekly card-reports is stated on pages 83 and 84 of this Report; on page 84 is an example of these reports properly filled out. When a report of a new health officer of a city or village is received, a printed letter is sent (if health officer of a village it is number [149], if of a city, a similar letter is sent) with a circular describing the plan of the reports, and transmitting supplies for making them.

A list of observers of diseases for the calendar year 1890 and a compilation of their reports, with a study of relations of sickness to climatic conditions is printed in this Report, pages 82-146. The sickness statistics of Michigan, based upon these weekly reports by the leading physicians in the State, are probably the most important sickness statistics in the world. They are also made especially useful, for the purposes of studying the causation of diseases, by reason of the excellent system of meteorological statistics which have now been collected during such a long series of years as to make them exceedingly useful for such combinations.

ANNUAL REPORTS BY HEALTH OFFICERS FOR THE YEAR ENDING DEC. 31, 1890.

In December, 1890, a circular [152] which had been approved by the Board, was sent to the health officer of each township, city and village in the State, about 1,600 in all, transmitting a blank form [I] for use in making his annual report to this office. This circular was substantially the same as circular (65), which is printed on pages viii-ix of the Report for 1884. Blank form [I], for reports of health officers, is printed in former Reports. With the circular [152] was also transmitted a blank for a copy of the record of diseases dangerous to the public health, similar to the blank which is printed, reduced in size, on page 271 of the Report for 1882.

Where the name of the health officer had not been returned to this office, the blanks were sent to the president of the village, the mayor of the city, or the supervisor of the township, according as the vacancy occurred in a village, city or township.

ANNUAL REPORTS BY CLERKS OF LOCAL BOARDS OF HEALTH FOR THE YEAR ENDING DEC. 31, 1890.

At the same time (December, 1890) that the circulars and blank forms were sent to the health officers, a circular [153] asking for a report, and a blank form [J] on which to make a report, were sent to the clerk of the local board of health of each township, city and village in the State, about 1,600 in all. A blank form for a copy of his record of cases of diseases dangerous to the public health was also sent; the circular and blank form sent to the clerk were similar to those sent to the health officer, except that they were not so explicit in questions relating to sickness and deaths.

RETURN OF NAMES OF MEDICAL PRACTITIONERS.

About January 1, 1891, blanks for the return of names of Medical Practitioners were sent to each of the clerks of the townships, cities and villages, about 1,600 in number. An example of these blanks is printed on page xi of the Report of the Board for 1888.

NAMES AND ADDRESSES OF HEALTH OFFICERS OF TOWNSHIPS, CITIES AND VILLAGES.

In April, 1891, the usual demand was made upon supervisors of townships, presidents and clerks of villages, and mayors and clerks of cities, for returns of the names and postoffice addresses of health officers. The circular and blank forms used are similar to those printed on pages xiii-xiv of the Report for 1884. In June, 1891, a second demand was sent to localities from which no return had been made in response to the demand in April. On the outbreak of a dangerous communicable disease in a township, city or village in which no health officer has been reported, a third, and even a fourth demand for the appointment of such officer, and the return of his name, is generally made.

Through the systems of reports to the State Board of Health by its corps of correspondents, as well as by the local health officers, and by a systematic searching of the local columns of the country newspapers published in Michigan, the Secretary of the State Board often receives information of an outbreak of a communicable disease, and desires to communicate at once with the health officer; but if no health officer has been appointed in that locality, or no return of such appointment has been made, delays occur, and before the Secretary of the State Board can get into correspondence with the delinquent local board and a health officer can be chosen, the disease may spread widely within or without the limits of the village or township, with unncessary sickness and loss of life.

It should be said that there is an increasing tendency to comply with this law, and local boards now generally act promptly and coöperate cordially with the State Board of Health in its endeavors to prevent the spread of dangerous communicable diseases.

METEOROLOGICAL REPORTS.

A list of meteorological observers for the calender year 1890, with a statement of what registers were received from each, is printed in this Report. The reports are summarized in an article in this Report on the Principal Meteorological Conditions in Michigan in the year 1890, pages 1–81. The data are of great value for the purposes of studying the causes of diseases. The observations made at the office of the Board, at Lansing, have been summarized weekly, and a copy kept on file in the office.

DISSEMINATION OF INFORMATION.

PUBLISHED LIST OF NAMES AND ADDRESSES OF HEALTH OFFICERS.

The names and addresses of 1,388 health officers in Michigan were printed in August, 1890, and a copy of the pamphlet sent to each health officer in Michigan, in order to facilitate his ready notification, to the health officer of any locality in this State, concerning the possible spread of any dangerous communicable disease; also to facilitate correspondence on any of the numerous questions with which health officers have to deal. The pamphlet was also sent to each of the delinquent boards of health, in the hope that, on seeing the blank where there should be the name of a health officer they would then comply with the law which requires the appointment of a health officer and the return of his name. In some instances that was the result. The pamphlet has also been useful, in the Office of the Secretary of the State Board, for several other purposes.

DISTRIBUTION OF INFORMATION HOW TO RESTRICT AND PREVENT DANGEROUS DISEASES.

Whenever information is received of the occurrence of diphtheria, scarlet fever, measles, small-pox, typhoid fever, or typho-malarial fever, copies of a document on the restriction and prevention of the disease reported are immediately sent to the health officer, with a request that he distribute them where they will be likely to be read, and it is suggested that the neighbors of those families in which the sickness occurs would be most likely to read them at such times of danger; and it is thought that after reading them they will be most likely to co-operate with the local health officer for the restriction of the diseases. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board in this manner—in localities where the disease treated of in the pamphlet is present. They are being distributed in this way all the time, because there is no time when the State is free from scarlet fever or diphtheria, these being among the most important of the dangerous communicable diseases in Michigan. Copies of the documents on diphtheria, scarlet fever, and small-pox, in German or in Dutch, are also sent when it is thought they can be used to advantage. Owing to frequent requests for documents in French, Polish, Swedish, and Danish-Norwegian, translations of a leaflet on contagious diseases [47.] have been made into each of these languages; and copies are sent to local boards when so requested.

A record is kept of reports received and of correspondence relative to each outbreak of a dangerous communicable disease of which the office receives information. A compilation of such information relative to several of the most important diseases is published in this volume.

PRINTING AND PUBLISHING OF PAMPHLETS, LEAFLETS AND DIAGRAMS OF INFORMATION, DURING THE FISCAL YEAR 1891.

In July, 1890, 2,000 copies of the two-page leaflet having on one side a form for "Householder's or Physician's Notice of a Communicable Disease," and on the other side, the sections of "Law Requiring Householders and Physicians to Report a Communicable Disease," were reprinted for distribution to local boards of health, to serve as samples for local boards to supply to local physicians. In July, 1890, 1,600 copies of the pamphlet "Names and Addresses of Health Officers in Michigan in 1890–91," were printed and distributed.

In July, 1890, 10,000 copies of the pamphlet [106.] on the "Restriction and Prevention of Diphtheria" were reprinted for distribution, by the method explained on a preceding page.

In August, 1890, 10,000 copies of the pamphlet [110.] on the "Restriction and Prevention of Scarlet Fever" were reprinted for distribution.

In August, 1890, 1,000 copies of the pamphlet [161.] on the "Restriction and Prevention of Typhoid and Typho-Malarial Fever" were printed.

In November, 1890, 1,600 copies of [163.] "Abstract of Proceedings of the Michigan State Board of Health. Regular Meeting, October 14, 1890," were printed and distributed.

In January, 1891, 1,000 of the leaflet "Recent Saving of Life in Michigan," were reprinted from the Proceedings of the Vicksburg Sanitary Convention, and widely distributed, through its being copied into many of the newspapers published in Michigan.

In January, 1891, 1,000 copies were printed of the two-page leaflet having on one side a diagram entitled "Deaths in Michigan, 1876–87," exhibiting graphically the relative mortality from each of several important causes of death, and on the other side of the sheet diagrams of "Pathogenic Micro-Organisms 'Germs' of Diseases;" in March, 1891, the same leaflet was again reprinted to the number of 2,000 copies.

In January, 1891, 1,000 copies of each of the diagrams "Isolation and Disinfection Restrict Scarlet Fever," and "Isolation and Disinfection Restrict Diphtheria," exhibiting the evidence of the experience in Michigan in 1888, were reprinted for distribution. In April, 1891, the diagram "Isolation and Disinfection Restrict Scarlet Fever" (evidence collected in 1888) was again printed to the number of 5,000 copies.

In February, 1891, 2,000 copies of a leaflet No. [167.] "The Prevention of Small-Pox," were reprinted and widely distributed. In April 5,000 more copies were reprinted.

In February, 1891, 10,000 copies of the pamphlet "The Prevention of Typhoid Fever, No. [124.] were reprinted, for distribution in localities where that disease is reported present.

In May, 1891, 1,600 copies of the "Abstract of Proceedings of the Michigan State Board of Health,—Regular Meeting, April 14, 1891," were printed and distributed.

A pamphlet No. [120.] "Work of Health Officers and Local Boards of Health," was reprinted in May, 1891. Copies of this pamphlet are distributed to health officers and members of local boards of health, and to other persons who may need to know the duties of such officers, and the laws relative thereto.

As fast as the names and addresses of health officers for 1891 were received, a copy of the pamphlet, No. [120.] detailing the duties of health officers, was sent to each, together with blanks [L.] for the prompt report of dangerous communicable diseases, and sample copies of the pamphlets on the prevention and restriction of diphtheria, scarlet fever, typhoid fever, typho-malarial fever, and small-pox, a pamphlet reprint on the "Restriction and Prevention the Dangerous Communicable Diseases," and a copy of each of two leaflet diagrams, one exhibiting the experience in Michigan in 1887 and 1888 in restricting scarlet fever, the other exhibiting the experience in restricting diphtheria, also the Laws Relating to Public Health in force in Michigan in 1890.

HEALTH BULLETIN, WEEKLY AND MONTHLY.

The weekly reports of diseases received up to Wednesday of the week following the week for which they are made, are compiled on that day, week by week, and a bulletin, based on that compilation, is sent for publication to a number of newspapers, and to sanitary and medical journals. A telegraphic abstract from the compilation is also sent weekly to a Michigan Press Association. A specimen of this weekly health bulletin can be found on page xii. of the Report for 1884.

Beginning with the month of August, 1884, a *monthly* health bulletin has been issued immediately after the close of each month, for the use of sanitary and medical journals. Beginning with the bulletin for the month of September, 1889, a third column was added, being the average for the bulletin month in the preceding series of years, beginning with the year 1886. This enables the reader to make a comparison of the prevalence of each disease in the last preceding month with the same disease in the corresponding month in the preceding series of years. An example of this form of bulletin is printed on pages xlv–xlvi of the Report for 1890.

Beginning with January, 1890, and ending with February, 1891, a supplementary bulletin was prepared representing graphically the relative amount of sickness from each of the principle diseases in the month for which the bulletin was issued. This was sent with the regular monthly bulletin for the same month. A sample of this graphic bulletin is printed on page xlvii of the Report for 1890, and one is printed on page 85 of this Report.

DIAGRAMS OF INSTRUCTIVE EXPERIENCE IN MICHIGAN.

Two diagrams, "Isolation and Disinfection Restrict Diphtheria," and "Isolation and Disinfection Restrict Scarlet Fever," have been prepared, and many hundreds of them printed and distributed as heretofore mentioned. They exhibit, in a condensed form, the experience of the health officers in Michigan, in 1888, with these two important diseases. The evidence in them is similar to that in similar diagrams which have been published for other years.

ABSTRACTS OF PROCEEDINGS OF MEETINGS.

Abstracts and brief accounts of the proceedings at meetings of the State Board of Health are prepared, printed, and distributed soon after the regular meetings of the Board. (Extracts from these abstracts are printed on preceding pages in this Report.) The distribution of the pamphlet Proceedings is not the same for all meetings, being to different classes of persons, according to the nature of the contents, in some instances being sent to teachers and school officers, in other instances to health officers, etc.

REPRINTS.

Reprints, of articles in the Report and in Proceedings of Sanitary Conventions, have been made in pamphlet form, and sent in answer to queries, in letters, that can best be answered in that manner. For example, many reprints of the article relative to alleged nuisances in the preceding year, have been thus sent out, in response to questions.

OBITUARY NOTICE OF PROF. A. ARNOLD CLARK OF LANSING, MICHIGAN.

Prof. A. Arnold Clark was for some years a valued clerk in the office of the State Board of Health; and, while attending and taking part in a sanitary convention held under the auspices of the Board at Alpena, July 10 and 11, 1890, Mr. Clark was taken violently ill and was obliged to return to his home at Lansing. Upon reaching Lansing Mr. Clark had become so weak that he was unable to walk from the carriage to the house without assistance. Medical attendance was summoned. For some weeks he was very low with fever, and was very slow in convalescing. About the middle of August he was able to ride and walk out, but not yet able to resume his duties at the office, although he did considerable work for the office at his residence. All this time, however, he was troubled with a bad cough which grew steadily worse until about Christmas when he was again confined to his bed, and did not again get out of doors until about the last of January, when it was thought best by his friends, for a change of climate; and on January 28, 1891, he left for Aiken, S. C., accompanied by his father and mother. He died at Aiken, S. C., March 2, 1891, at 10 p. m.

March 3, on receipt of a telegram from Aiken, the Secretary immediately sent a letter to members of this Board announcing the death, as follows:—

To the Members of the Michigan State Board of Health:

It becomes my painful duty to announce the death of Prof. A. Arnold Clark, with whose admirable character, brilliant scholastic attainments, and very valuable work for this State, since February 1, 1885, you are familiar, he having been employed by this Board. His illness seemed to have been incurred about the time of the sanitary convention at Battle Creek, June 26, 1890, but did not fully develop until his attendance at the Alpena sanitary convention, July 10, from which he returned very sick. He recovered from the fever; but lung disease was a sequel. January 28, he went south; and for a time he was better, but brain disease supervened, and he died at Aiken, S. C., last evening, March 2. The funeral will be in Lansing, probably next Thursday, March 5.

Very respectfully,

HENRY B. BAKER, *Secretary.*

Mr. Clark was a very scholarly and cultured man, and a very fluent speaker. As a boy, he was an efficient temperance lecturer. As a teacher he was successful, being enthusiastic and entertaining. He was an active member of the two leading literary clubs in Lansing, and his addresses before them have been entertaining, instructive and brilliant, especially those on philology in which he was deeply versed. His position as correspondence clerk, in the office of the State Board of Health, required that he should have a thorough knowledge of the health laws of Michigan, of the recent great advances in sanitary science, and of the most approved methods of public-health administration. These branches were quickly grasped by him, and he soon made himself of great use in that position. Aiding the office of the State Board of Health in carrying on the sanitary conventions provided for by law, he soon came to be a very instructive and entertaining speaker on several topics of vital importance to the people; and hundreds of people in Michigan who have heard his short discussions of such topics or his more elaborate addresses will greatly regret to hear of his death. The published proceedings of the sanitary conventions in Michigan, contain many such valuable contributions by him on subjects bearing upon the prevention of unnecessary sickness and premature deaths. His valuable work in Michigan attracted the attention of prominent sanitarians in other States, and by invitation of the Pennsylvania State Board of Health he delivered the Annual Address before that Board at Norristown, Pa., last summer. That address, with an excellent photo-engraved likeness of Mr. Clark, is published in the *Annals of Hygiene, Philadelphia, July, 1890.*

The following are copies of letters received from Dr. Hazlewood of the State Board of Health, Dr. Avery, President of the Board, and Ex-Governor Cyrus G. Luce:

Grand Rapids, Mich., March 4, 1891.

DEAR DR. BAKER:—The announcement of the death of our esteemed friend A. A. Clark came today.

In the presence of such visitations words, however ably expressed, convey but cold comfort to the immediate family of the deceased, therefore I refrain from writing the parents, but when opportunity comes please to convey to them my sympathy and assurance of the very high esteem in which I held the character and attainments of their son, and I mourn with them and others at his untimely (as it seems) and premature removal from our midst. I should have been pleased to show my respect by a personal attendance at his funeral, but have too many other duties to attend to to make this possible.

Very respectfully,

A. HAZLEWOOD.

Greenville, Mich., March 7, 1891.

H. B. Baker, M. D.:

DEAR DOCTOR—It was with sincere sorrow I received your announcement of the death of A. Arnold Clark. I regarded him one of the brightest and most promising young men in the State. His death is a public loss. Please convey to his mother, father and friends my sympathy in their deep and sad affliction. I very much regret I was not able to attend the funeral.

Very respectfully,

JNO. AVERY.

Coldwater, Mich., March 5, 1891.

MY DEAR MRS. CAHILL:—Your kind favor of the 3rd was received here during my absence in Grand Rapids.

I too am a sincere mourner because of the early death of the gifted and brilliant A. Arnold Clark. For his ability and industry I respected him. For his purity of character, for his fidelity to convictions, and for his lofty purpose and aspiration I loved him as a son. With reason his friends anticipated for him a useful and noble life. While nothing can rob us of the past, yet hopes for the future will now slumber in the grave.

I deeply regret that I cannot join with others of his large circle of friends in paying a last tribute of respect to one whom I esteemed so highly, but circumstances which cannot be changed prevent my doing so. But though absent in the body my spirit will be with the mourners. Please convey to the stricken father and mother my sympathy with them in this sore affliction and my regret that I cannot be with them on this sad occasion.

Your sincere friend,
CYRUS G. LUCE.

The following is an extract from a letter received from Benjamin Lee, M. D., Secretary of the Pennsylvania State Board of Health.

1532 Pine St., Philadelphia, Penn., March 10, 1891.

Dr. Henry B. Baker, Secretary State Board of Health, Lansing, Michigan:

DEAR DOCTOR—I have heard no news in a long time that has caused me profounder grief than that contained in the paper received this morning, I presume from yourself, of Mr. Clark's death. He was a man whom your Board and the country could ill afford to lose. The impression which he made upon our convention was a very strong one. I have rarely listened to a more forcible and effective speaker. His social qualities too were conspicuous. In the few hours that I spent in his society I felt that he was already a friend."

James A. King, M. D., Manistee, Michigan, wrote as follows:

Manistee, March 13, 1891.

Henry B. Baker, M. D., Lansing, Michigan:

DEAR SIR—It was with the deepest regret that I learned through the press, and later by your communication, of the death of A. Arnold Clark. His versatile and brilliant qualities had made him a universal favorite with all who knew him, and I am sure I echo the sentiments of all his acquaintances when I say that I confidently anticipated his becoming one of the first men of his age. Knowing as I do of the friendly relations existing between yourself and Mr. Clark I appreciate how deeply you must feel the loss of such a friend and such an efficient brother laborer in your grand work. For myself I feel as though I had lost a friend I had known intimately for years, though we had met but on two different occasions. If acquainted with his family, please tender them my most heartfelt sympathy.

Ever yours respectfully,
JAS. A. KING.

The following is extracted from *The State Republican*, Lansing, March 7, 1891:—

"END OF A USEFUL LIFE.—PROF. A. ARNOLD CLARK HAS CEASED HIS LABORS ON EARTH.—HE DIED MONDAY NIGHT AT AIKEN, SOUTH CAROLINA—SHORT SKETCH OF HIS LIFE.

"A. Arnold Clark, one of Lansing's brightest young men, died Monday night, with his parents by his bedside, at Aiken, South Carolina, where he had gone in hopes of improving his health. * * * *

"A. Arnold Clark was a young man of very active brain, kindness of heart and stability of character. Too often newspaper obituaries are made more with regard to the station of the deceased person's position and family rather than on merits and intrinsic worth, but in the present instance too much could not be said; a panegyric could not flatter if treating only of the scores of good qualities the young man really possessed. He was born in Eckford, Calhoun county, in January, 1861, and received his education at the Albion (Mich.) university, graduating therefrom in 1881 with high honors, taking the degree of B A. The year following, the college conferred upon him the degree of M. A. Subsequently he accepted a professorship in the Rork academy at Sherwood, teaching language and history.

" Mr Clark came to Lansing with the Rork academy six or seven years ago, continuing as professor of language. February 1, 1885, he engaged as corresponding clerk in the State Board of Health office, under Secretary Henry B. Baker, retaining his position until taken ill, though offered many flattering positions in other lines of work, principally of a literary nature. During his work at the Board of Health office he gained an extensive reputation as a lecturer of unusual ability and brightness. One of his best efforts was delivered July, 1890, before the Pennsylvania board of health, published in the Annals of Hygiene. As a temperance lecturer, in his younger days, his reputation was no less enviable. His most valuable work has been in sanitary lines, and he was the author of a great number of excellent works on public health that have been largely circulated.

"Mr. Clark was a splendid linguist and was especially of a literary turn of mind, even prominently so. He was a highly honored member of the U and I and A to Z clubs of Lansing, and has been among their best contributors. He embraced the doctrines of Henry George. A charming personality, a frank and open manner, a keen, appreciative and affectionate nature, and above all his bright mental powers made him extremely popular among his many associates."

Memorial exercises were held at the First Congregational church, at Lansing, Sunday afternoon, March 8, 1891, and were conducted by Rev. C. H. Beale. Rev. Mr. Beale's remarks were extemporaneous, but have since been reproduced as follows. Dr. Henry B. Baker read an address which was in manuscript form and follows the address by Rev. Mr. Beale.

ADDRESS OF REV. C. H. BEALE.

It would be impossible to find words that would adequately express our feelings on this occasion. I, certainly, will not attempt it. I shall only talk to you familiarly about our departed friend. If any one who knew him should begin to tell of his various qualities, the first thing mentioned would be his brilliant intellect. What a wonderful memory he had! I heard him once give an extemporaneous address on Orators and Oratory which showed that he was familiar with the whole literature of the subject and which was so illustrated and enlivened by incident and anecdote that he held the unwearied attention of his audience until the clock gave notice that the limit was reached. On various themes he was equally at home and equally interesting. His reasoning powers and imagination were scarcely inferior to his remarkable memory.

The next thing that would be mentioned was his imperturbable good nature and abounding cheerfulness. The smile upon his face became chronic and contagious and his elasticity of disposition made him proof against the depressing effects of care, misfortune or sickness. In harmony with this was an unfailing optimism. He believed in progress and in a bright and glorious future for the race. He knew well the story of struggle and sorrow which the history of man contains and he appreciated the difficulties in the way, and the strength of the forces to be overcome; but he possessed an unshaken, an immovable faith in the advancement of society along every line of achievement and in every department of human life. Equally prominent was his affectionate nature which showed itself in good will to all with whom he came in contact, a warm hearted and unchanging friendship for the smaller circle of congenial souls and the unmeasured love that he lavished on the dear ones in his own home. We have a higher idea of friendship from having known Arnold Clark.

His death seems untimely and his life a short one. But if we measure life by heart beats and thoughts and experiences and emotions, by the joys and the achievements of a career rather than by the clock and the almanac his was a long life. His childhood was a singularly happy one. In his school days he could reach with a bound—we might better say by a flight—what others gained only by slow plodding efforts. He entered so enthusiastically into his work and found such satisfaction in it that the joys and experiences of a long life were crowded into his few years. We can not help thinking what might have been accomplished had his mind and heart and disposition been associated with a more rugged and stalwart frame. What was his outlook upon the world and what his conception of life? Show us a man's favorite books, his choice selections, the songs he sings over and over again, and we know his attitude of mind toward the great facts and mysteries of life. Here is one of our friend's favorite hymns:

"The harp at Nature's advent strung
Has never ceased to play;
The song the stars of morning sung
Has never died away.

* * * * * *

"The blue sky is the temple's arch;
Its transept, earth and air.
The music of its starry march
The chorus of a prayer.

* * * * * *

"So Nature keeps the reverent frame,
With which the years began;
And all her signs and voices shame
A prayerless heart in man."

His view of life and its aims is well set forth in our own sweet poet Longfellow's "Psalm of Life" which was always a great favorite with him. He did not have the strong convictions that some of us think we have about God and immortality, but he looked forward with hope and when he saw the end approaching he only asked to be sung to sleep. With almost superhuman fortitude his adored mother sang to him the songs of faith and hope as he passed out of this life.

I can think of no words that would more clearly express his thought and hope than these lines of Tennyson:

"Sunset and evening star,
And one clear call for me!
And may there be no moaning of the bar,
When I put out to sea,

"But such a tide as moving seems asleep,
Too full for sound or foam,
When that which drew from out the boundless deep
Turns again home.

"Twilight and evening bell,
And after that the dark!
And may there be no sadness of farewell,
When I embark;

"For tho' from out our bourne of Time and Place
The flood may bear me far,
I hope to see my Pilot face to face
When I have crost the bar."

To his beloved father and mother we can only say that we sorrow with you and for you; we bring to you our deepest sympathy and breathe for you our most earnest prayer. When the shadows of night are left behind and the eternal morning dawns may we meet our friend where every power finds sweet employ, in the life where one hour of blessed companionship shall be full compensation for all the sorrows of earth!

ADDRESS AT THE MEMORIAL SERVICES FOR A. ARNOLD CLARK, LANSING, MICHIGAN, MARCH 8, 1891.

BY DR. HENRY B. BAKER, LANSING, MICHIGAN.

In responding to the request by which I have been honored, I am to try to give expression to my thoughts and not to my feelings on the sad occasion that has brought us together. Having been for several years intimately associated with our departed friend, whom I deeply loved, honored and respected; my task is to repress those feelings which would incline me to sit silently with the mourners; to give expression only to such thoughts as may tend to comfort us, or if not that, then to thoughts which we may profitably consider, for our future well being. This is a difficult task; for my first and most constant thought is of the great loss we have sustained; a vigorous young man, with remarkable intellect, thorough culture, honest purposes, kind heart, gentlemanly bearing, agreeable manner, philanthropic disposition, a noble and effective worker for the good of mankind, has been taken from us; we feel that it should not be so, that we cannot have it so; what good lesson can be learned from it; what is there in our thoughts to give us comfort? Even the probable cause of his death is painful to consider, because of the fact that during the past few years he himself has done so much to master and teach the modes of causation and prevention of such diseases. Better than any other man in Michigan, was he able to teach an audience how to stop or lesson the ravages of what he, not infrequently spoke of as the "great white plague." Just here is an important lesson which A. Arnold Clark knew well, and which we should all learn. I am not undertaking to teach in the domain of morals or religion, that remains for our minister, but it is absolutely certain here, in this physical field, that "man cannot live to himself alone." Man *is* his brother's keeper. However much one may know of the causes and prevention of those diseases which now cause the most deaths among us, each one of us is, to a very great degree, endangered by his fellow beings. This is not the time to explain why this is so, but I wish most emphatically to express the convictions that it *is* so; and to urge the importance of a general acceptance of that thought,—that, although personal hygiene is important and useful, public sanitation is vastly more important, that no one of us can protect his own life from any of the present most dangerous diseases by his own actions alone, or in any way, except all the people join with us in the undertaking. We are thus vitally interested in the welfare of our fellow creatures. It behooves us not only to know the way of life, but to see to it that it is pointed out to all; because the lowest and most degraded pauper may, unintentionally and ignorantly, convey his most deadly malady to the millionaire, or to the most learned sanitarian. In the work of enlightening the people on this subject, A. Arnold Clark was a master, a leader, and therefore one who could least be spared.

Possibly some of us have not yet learned that other important lesson—why it is that our leaders are so often destroyed. Just why our leaders in this direction are in especial danger, it is not my purpose now to discuss; but a reference to a few well-known facts may serve a useful purpose. We know that, although to all of us there is some risk, the soldier is especially liable to die a violent death, that the fireman is, more than most of us, liable to be killed at a fire; we know that one who has not had yellow fever is more liable to that disease if he goes where it is; ought we not to expect one whose constant employment relates to the most dangerous diseases, to be in especial danger therefrom? I leave this thought with the remark, that, so far as we know and believe, our beloved friend contracted his recent sicknesses while in the line of duty.

We hear much about over-work, and few appreciate its dangers more than did our departed friend. If he himself over-worked, it was because of an over-powering desire to do the many things which his bright mind saw need for accomplishing. But who are they who over-work? Not the useless drone, who lives by the work of others; but the brightest and most philanthropic of our race, more especially the leaders in thought, because brain work is the most exhaustive labor.

A. Arnold Clark was especially gifted in a useful knowledge of what has been written. The following scriptural text has suggested itself to my mind, and may to a slight extent be suggestive, to some of you, of one line of thought to which I wish to give expression. "And that, from a child, thou hast known the holy scriptures which are able to make thee wise unto salvation,"*—From his youth, Arnold Clark has, I believe, known the "holy scriptures" of the ancients; he has also known the scriptures,—the writings, which, in literature, stand as the classics; later in life, he has known the scriptures of many of the most modern contributors to general literature, and to political, social and scientific progress. His mind was stored with an exceedingly great number of selections, from these several sources, illustrative of ideas well and beautifully expressed by the masters in those fields of thought. His mental grasp of them was such that in his own speeches and papers he was able to apply these thoughts and expressions of the masters, in ways which were exceedingly attractive, entertaining and instructive. His love of truth led him to be an admirer of the sciences. Making no claims himself to leadership in any of the physical or medical sciences, yet he had the rare gift of selecting and grasping that which was true in the reports of progress in several of these sciences. Accordingly, he was an able, as well as an entertaining lecturer on several branches of sanitary science. His classical education, his well-stored mind, and his love for the true and the beautiful led him to express his thoughts in language which was wonderfully effective and attractive. This was recognized, not only in Michigan, where he has spoken at the State sanitary conventions, but also by sanitarians in other states, and last year, by invitation, he delivered the public annual address before the State Board of Health of Pennsylvania, at a convention held in Norristown.

Our present loss is all the more a loss, because of the very few who serve us, as he was able to serve. It is a loss to the State, to the nation, and to all mankind. Among the two millions of people in Michigan, and among the leaders in this work in the United States and in the several provinces of Canada, I have known of no man who could equal him in ability to master and teach the leading truths of sanitary science, public-health administration and the economic questions involved therewith.

Frequently we hear a man spoken of as "one in a thousand," "one among ten thousand," or "one among thousands." A. Arnold Clark was a man among millions.

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* Paul to Timothy, ii., 3.15.

Regarding such a man one could truly pray—as in the poem "Abou Ben Adhem"—"May his tribe increase." The world has great need for such as he; and it is so painful to reflect on what seems his premature removal from us, that I hasten to suggest that ideas and ideals are widely transmitted—they are reproduced—and that in the comparatively few years during which A. Arnold Clark has worked in this earthly vineyard he has accomplished far more than thousands, yes, millions, of men who have lived out their full three score and ten years. The perfecting of an ideal which shall be and remain enshrined in the hearts and minds of thousands of human beings as an ideal worthy of emulation, is a grand life work. That having been done in thirty years or less, it is something for us all to honor, to cherish in our memory, to strive that it may be reproduced and multiplied.

Monday morning, March 9, the remains, accompanied by numerous friends and the pall-bearers, were taken to Fredonia, Michigan, where the funeral was held in the Fredonia Methodist Church. The remains were interred in the Fredonia cemetery.

AN ALLEGED DANGEROUS RAILROAD CROSSING AT RAISIN CENTER. THE DANGER THROUGHOUT MICHIGAN AT GRADE CROSSINGS OF RAILROADS.

The correspondence relating to the dangerous railroad crossing at Raisin Center Junction of the Wabash, and Jackson branch of the Lake Shore railroads, and relating to the general subject of grade crossings of railroads, is here printed, in order of dates, as follows:

Holloway, Mich., February 3, 1891.

Henry B. Baker, M. D.:

DEAR SIR—I write you for information in regard to a certain railroad crossing in our township which I consider very dangerous to the public. They have just put the interlocking switch in at Raisin Center junction of the Wabash and Jackson branch of the L. S. In the future, trains will cross there at a high rate of speed, and the conditions are such that some person will get killed there often. Now what I wish to know is this: Have I any duties to perform? And if not how shall the public proceed in the matter? I will diagram the situation on the back of this letter.*

Respectfully,
CHAS. E. BEGEL, M. D.,
H. O. of Township of Raisin, Lenawee county.

P. S. You will notice that there are buildings and embankments that obscure the view in two directions, which will make it the most dangerous crossing that I know of.

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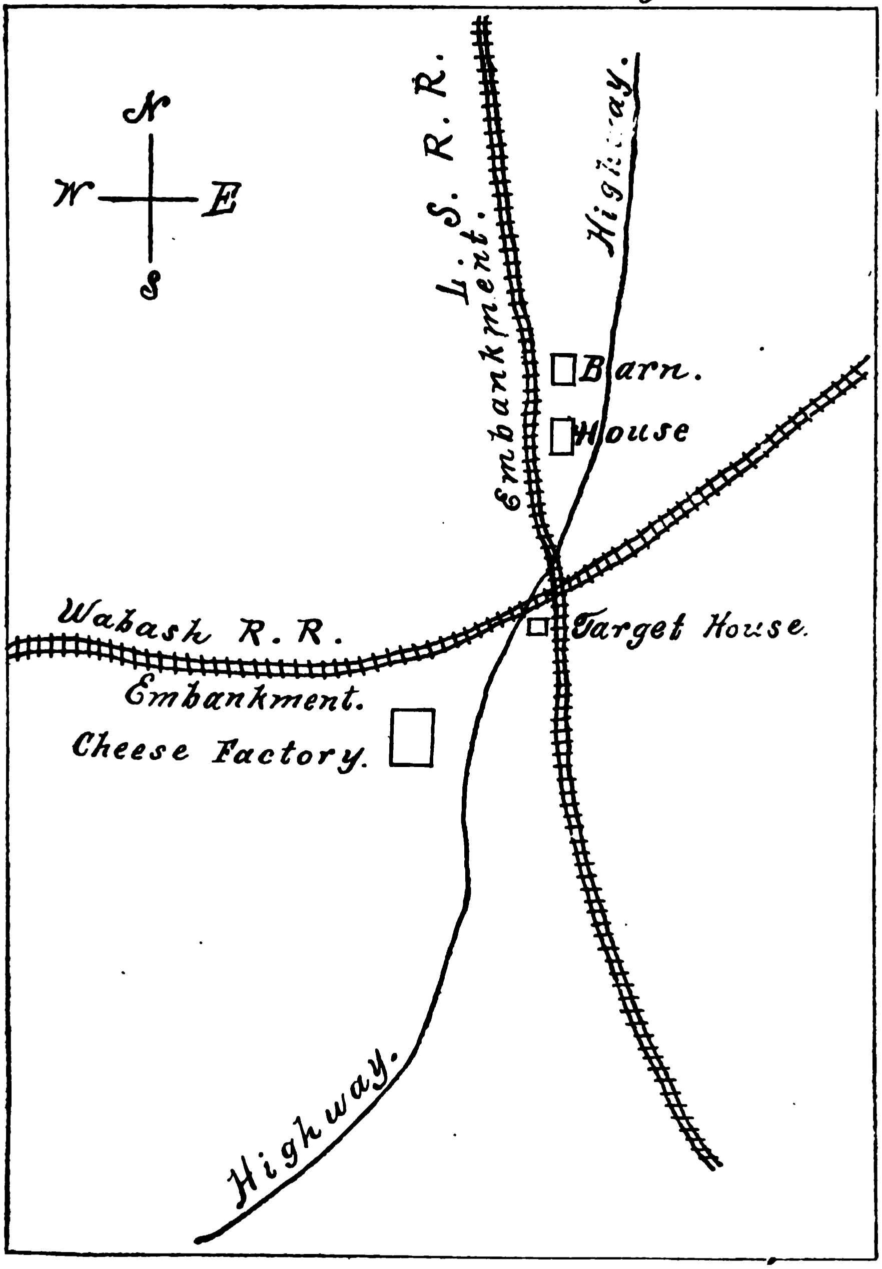
*The diagram showing the situation of the alleged dangerous railroad crossing at Raisin Center junction of the Wabash and Jackson branch of the Lake Shore railroads is here printed, on page lxxxiii.

Dangerous Railway crossing at Raisin Center junction, Mich.



MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Michigan, February 7, 1891.

HON. CHAS. R. WHITMAN, *Commissioner of Railroads, Lansing, Michigan:*

DEAR SIR:—Enclosed herewith, I send a copy of a letter from the local health officer, relative to a dangerous railroad crossing at Raisin Center junction of the Wabash and Jackson branch of the Lake Shore railroad. It seems to me that the crossing is a dangerous one, and that *some* officer should take action to lessen the danger. I know of no law that will enable the local board of health to do more than call attention to the subject. The law makes the State Board of Health "have the general supervision of the health and life of the citizens of this State." I would be glad to know of any line of action likely to lessen the danger under such conditions as are described in the communication, a copy of which I send you; and I will be thankful to you for any recommendations or suggestions.

I understand that there are railroad crossings in this State where no person can drive a loaded wagon or carriage across with reasonable safety to the occupants, for the reason that, because of the great speed, some of the trains pass over that part of the track which can be seen by the driver in less time than it takes the driver to cross, and therefore it would sometimes be beyond the power of the driver to avoid the danger.

It seems to me that *no* highway should cross at a junction of two railroads and thus insure that every person who crosses the track shall be in danger from a train which may come from either one of four directions, and that if in this instance the highway were to cross each of the two roads sufficiently distant from the junction to be beyond the switches, (somewhat as marked in red on the enclosed diagram*), the danger would be greatly reduced. Inasmuch as there are embankments on one side, possibly the highway might easily pass under the railways.

I understand from Mr. Conger, Mechanical Engineer in your office, that there are in Michigan many similar crossings ("hundreds?") as dangerous as this. The subject therefore is of considerable consequence, because it would seem that a general plan might be evolved which would be a general life-saving measure throughout the State.

Awaiting your reply, I am

Very respectfully,
HENRY B. BAKER, *Secretary.*

Response by the Deputy Commissioner of Railroads.

CHAS. R. WHITMAN, Commissioner.
ROBT. LAUGHLIN, Deputy Commissioner.
CLINTON B. CONGER, Mechanical Engineer.

Lansing, Mich., February 11, 1891.

Dr. Henry B. Baker, Secretary State Board of Health, Lansing, Mich.

DEAR SIR:—Yours of February 7th inst. enclosing a copy of a communication and diagram relative to a dangerous railroad crossing at Raisin Center Junction of the Wabash and Jackson branch of the Lake Shore railroads duly received.

The crossing in question is undoubtedly a very dangerous one and the public will need protection at that point.

Gates so erected on each side of the railroad crossing to swing across the highway upon the approach of a train would accomplish the purpose.

The matter has been taken up with the proper officers of the two companies with a view of establishing the necessary protection as early as possible.

Yours respectfully,
ROBT. LAUGHLIN,
Dep. Commissioner of Railroads.

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* The diagram "Dangerous Railroad Crossing at Raisin Center Junction, Michigan," is printed on page lxxxiii

MICHIGAN STATE BOARD OF HEALTH,
OFFICE OF THE SECRETARY,
Lansing, Mich., February 16, 1891.

Robert Laughlin, Deputy Commissioner of Railroads, Lansing, Michigan:

DEAR SIR:—Please accept cordial thanks for your letter of February 11 concerning the dangerous railroad crossing at Raisin Center.

My letter of February 7 to the Commissioner of Railroads had reference not only to this crossing, but to many others in Michigan, alleged to be as dangerous, and which subject I hope will be considered by your Office before the time expires for the introduction of bills in the present legislature, if, as I infer is the case, there is not now legal provision for doing away with them.

Very respectfully,
HENRY B. BAKER,
Secretary.

Present Result of the Correspondence.

Lansing, Mich., March 27, 1891.

Dr. Henry B. Baker, Secretary State Board of Health, Lansing, Mich.

DEAR SIR:—After due consideration and careful inspection of the Raisin Center highway crossing, by the ex-mechanical engineer, C. D. Conger, also the present incumbent, J. H. Desmond and my own views when on the ground in January of all the surroundings I have decided that the necessity for the erection and maintenance of gates or the necessity of a flagman does not exist. J. H. Desmond reports that on Friday, March 13 from 7:40 A. M. until 12:20 A. M. only one team and one man on horseback crossed at this point. Ex-Mechanical Engineer C. D. Conger who made an inspection of the same crossing in February reports substantially the same. Therefore for the present I shall decline to order any additional service at this point.

Yours very respectfully,
CHAS. R. WHITMAN, *Commissioner of R. R.*
per Robt. Laughlin, Dept. Comr.

Although this correspondence has thus far apparently failed to accomplish any useful action by the legislature such as was contemplated by the Secretary of the State Board of Health, it is hoped that the attention which has thus been, and through its publication will continue to be, called to the subject, will continue to influence toward the removal of all such dangerous crossings, and the consequent lessening of the dangers to life.

HENRY B. BAKER,
Secretary.

SHALL HEALTH OFFICERS OR PHYSICIANS EMPLOYED BY LOCAL BOARDS OF HEALTH RECEIVE REASONABLE PAY FOR LOSS OF PRACTICE WHILE CARING FOR CASES OF COMMUNICABLE DISEASES?

Dr. Joseph Marshall of Gaines, Michigan, was employed by the local board of health to treat a number of cases of diphtheria. In order to attend these cases he was obliged to give up his regular practice, because of the danger of communicating the disease. He wrote as follows:

> "In order that the board may fully understand the necessity of my being compelled to give up my practice, as a safeguard against the spread of contagious disease, as malignant diphtheria, (it would not be prudent to attend cases of confinement, or diseases where the mucous surfaces are involved, or diseases of children, under such circumstances, and especially in such cases as I described to you*). I would respectfully refer you to the Secretary of the State Board of Health, for which purpose I enclose stamp.
>
> Yours truly,
>
> JOSEPH MARSHALL, M. D."

In response to a communication on this subject, Dr. Henry B. Baker, Secretary of the State Board of Health, stated as follows:

> "I certainly think that a physician who is attending a case of malignant diphtheria should decline to attend cases of confinement, or diseases where the mucous surfaces are involved, or diseases of children, and that if all physicians would take this course it would surely lessen the spread of the dangerous diseases and the liability to cases of puerperal fever."

October 24, 1890, the following was received from Dr. Marshall:

> "I am very much obliged to you for your letter stating your opinion so freely concerning a few cases of diphtheria I wrote you about. My account was paid in full. This establishes a rule, in this part of the State, that a doctor must have pay for his services in contagious diseases where he is employed by boards of health. My fees ran from $12.00 to $24.00 a day."

It is probable that the subject mentioned in the last sentence of Dr. Marshall's letter is the one that is most prominent to the average supervisor, charged, as he is, with guarding the pecuniary interests of the people. But it should be remembered that even with a very liberal expenditure in this direction, there is likely to be, in the end, a saving of money values through lessening the numbers of cases of sickness and of deaths and the consequent expenditures for physicians, nurses, medicine, loss of time, funerals, etc.; but there is a higher view than this mercenary one, namely, that the outlay is primarily for the saving of human life and the prevention of human suffering; therefore, whether or not it shall finally prove to be most economical, it is the duty of those in authority to incur such reasonable expenses, to be paid by the people for the general good.

REPORT OF THE SECRETARY RELATIVE TO PROPERTY, ETC., FOR THE FISCAL YEAR ENDING JUNE 30, 1891.

To the President and Members of the Michigan State Board of Health:

GENTLEMEN:—In compliance with Section 5 of Article II of the by-laws of this Board, the following report of the "Nature and amount of property belonging to the Board, which has been received, issued, expended and destroyed since the last report, and of the property remaining on hand, and also in whose care each item of property is intrusted," is respectfully submitted:

Preceding reports should enable one to learn the items of property on hand at the beginning of the fiscal year 1891. My last report is printed on pages lxiv-lxxx, of the Annual Report for the year 1890. Since last report, instruments and articles of a similar nature have been purchased as follows:

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* It seems that Dr. Marshall had to be more closely associated with these patients than is usual where the physician prescribes and immediately retires.

PROPERTY PURCHASED.

Two photo-engraved plates—Relation of low water in wells and sickness from typhoid fever in Michigan.

One photo-engraved plate—Fogs and sickness from typhoid fever in Michigan.

Fifteen photo-engraved plates, relating to the meteorological conditions in Michigan in 1889.

One photo-engraved plate—Epidemic waves, deaths from diphtheria in England.

One photo-engraved plate—Typhoid fever and Sewers.

One photo-engraved plate—Map illustrating Sewerage and Water Supply of Alpena, Michigan.

One photo-engraved plate—Map of Alpena, Michigan, showing elevation of streets.

One photo-engraved plate—Diagram of brick and tile sewers at Alpena, Michigan.

One photo-engraved plate—"Ventilating Apparatus," Alpena, Michigan.

One photo-engraved plate—Relation of sickness from small-pox to Atmospheric Temperature in Michigan.

One photo-engraved plate—Relation of sickness from Influenza to Atmospheric Ozone (night) in Michigan.

Four photo-engraved plates, to illustrate Dr. Henry B. Baker's paper on the Relation of sickness from Consumption to certain meteorological conditions in Colorado.

One photo-engraved plate—Sickness from Consumption, and Temperature in 31 cities in the U. S.

One photo-engraved plate—Temperature, and Deaths from Phthisis in London, England.

One photo-engraved plate—Temperature, and sickness from Consumption in Michigan.

One photo-engraved plate—Temperature, and sickness from Pneumonia in U. S. Armies.

(No meteorological instruments were purchased during this fiscal year.)

PROPERTY LOANED.

Photo-engraved plates were loaned from the Office, as follows:

Six photo-engraved plates—Diagrams showing relation of certain meteorological conditions to diseases of the lungs and Air-Passages—were loaned to Dr. A. N. Bell, M. D., Editor of the "Sanitarian," Brooklyn, N. Y.

METEOROLOGICAL INSTRUMENTS ISSUED.

Meteorological instruments have been intrusted to observers for State Board of Health, as follows:

To Dr. W. C. Gates, Rockland, Michigan:—One barometer with hook and box; one maximum registering thermometer, with screw-bolt and pin; one minimum registering thermometer, with board and clips; one dry bulb thermometer, with board and clips; one wet bulb thermometer, with cup and wick; one rain gauge; one measuring stick for rain gauge.

METEOROLOGICAL INSTRUMENTS AND OTHER PROPERTY ON HAND.

With the exception of the photo-engraved plates which were loaned to Dr. A. N. Bell, of Brooklyn, N. Y., the foregoing mentioned plates were on hand at the close of the fiscal year.

Meteorological instruments remaining in the Office of the State Board of Health, at the close of the fiscal year, ending June 30, 1891:—

3 Barometers.
3 Maximum registering thermometers.
5 Minimum resistering thermometers.
10 Dry-bulb thermometers.
10 Wet-bulb thermometers.
2 Rain gauges.
3 Barometer boxes.
9 Psychrometer boards with clips.
4 Registering thermometer boards with clips.
7 Psychrometer cups.
2 Caps for over-flow tubes to rain guage.
4 Psychrometer clips.
7 Registering thermometer clips.
3 Psychrometer cups disabled by use.
1 Anemometer spindle.

19 Thermometers, broken while in use by the Voluntary Observers for the State Board of Health.
1 Dry-bulb disabled.
3 Min. Registering thermometers disabled.
1 Max. Registering thermometer disabled.
1 Standard instrument for inspecting oils.
7 Screw-bolts and 7 pins for supports for Registering thermometers.
2 Large galvanized iron pails for measuring snowfall.

ACCESSIONS TO THE LIBRARY.

Books and other publications have been received and placed in the library of the Board (during the fiscal year ending June 30, 1891) as follows:

BY GIFT, EXCHANGE, ETC. (*Names and addresses of donors are printed in italics.*)

Abbott, M. D., Samuel W., Boston, Mass.:—
Experimental Investigations by the State Board of Health of Massachusetts, upon the Purification of Sewage by Filtration, etc., 1888-1890.
Forty-eighth Report, relative to the Registry and Return of Births, Marriages, and Deaths in Massachusetts, 1889.
Twenty-first Annual Report of the State Board of Health of Massachusetts, 1889.
The story of the New England Kitchen.

Allan, M. B., James W., Glasgow, Scotland:—
Clinical Instruction in Infectious Diseases.

Ashford, C. W., Honolulu, Sandwich Islands:—
Biennial Report of the President of the Board of Health to the Legislature of the Hawaiian Kingdom, 1890.

Ashmun, M. D., G. C, Cleveland, Ohio:—
Eighteenth Annual Report of the Health Department of the City of Cleveland, Ohio, 1890.

Baker, M. D., Henry B., Lansing, Mich.:—
Malaria and the Causation of Intermittent Fever.
Sanitation in 1890.
A Plea for Public Health Work in Villages.

Barnes, M. D., Henry J., Boston, Mass.:—
Sewage—Application to land, the best treatment.
Utilization of Sewage.

Barwick, Sergeant James A., Sacramento, Cal.:—
Annual Meteorological Review of the State of California, year 1890.

Becker, Dr. K., Berlin, Germany:—
Monatshefte zur Statistik des Deutschen Reichs, Jahrgang, 1890.

Bidenkap, Dr. Christiania, Norway:—
Beretning orn Folkemaengden og Sundhedstilstanden i Christiania 1, Aaret, 1889.

Billings, M. D., John S., Philadelphia, Pa.:—
Public Health and Municipal Government.

Bishop, James, Trenton, N. J.:—
Twelfth Annual Report of the Bureau of Statistics of Labor and Statistics of New Jersey, year ending Oct. 31, 1889.

Board of Health, Fall River, Mass.:—
Thirteenth Annual Report of the City of Fall River, year ending Dec. 31, 1890.

Board of Health, Hartford, Conn.:—
The Sixth Annual Report of the Board of Health of the City of Hartford, Conn., year ending Feb. 28, 1891.

Board of State House Commissioners, Indianapolis, Ind.:—
Report of the Proceedings of the Board of State House Commissioners, from date of organization to Dec. 31, 1878.

Board of Health of the City, Manchester, N. H.:—
Annual Report of the Board of Health of the city of Manchester, N. H., year 1890.

Board of Health, Province of Quebec, Quebec:—
Le Cholera Comment le prevenir et le combattre.
Cholera: How to prevent and oppose it.

Board of Health, Reading, Penn.:—
Report of the Board of Health of the City of Reading, Penn., for the year 1890.

Board of Health, Newport, R. I.:—
Sixth Annual Report of the Board of Health of the city of Newport, R. I., year 1890.

Bogart, C. E., John, New York City:—
Transactions—American Society of Engineers, Vol. X, 1881.

Böhnert, Dr. Victor, Dresden, Saxony:—
Zeitschrift des K. Sächschen Statistischen Bureaus.
XXXV, Jahrgang, 1889.

Bobbyer, M. B., Philip, Nottingham, Eng.:—
Annual Report of the Borough of Nottingham for 1889.

Booker, Frederic, Coventry, England:—
Sixteenth Annual Report of the State Board of Health of the Coventry Urban Sanitary District, 1889.

Boyd, M. D., S. B., Knoxville, Tenn.:—
Annual Report of the Board of Health and Registrar of Vital Statistics, Knoxville, Tenn., year 1890.

Brigham, E. H., 19 Boylston Place, Boston, Mass.:—
Triennial Catalog and Directory of the Massachusetts Medical Society, 1890.
Medical Communications of the Mass. Medical Society, Vol. XV, No. 1, 1890.

Bryce, M. D., Peter H., Toronto, Ont.:—
Report of the Fifth Annual Meeting of the Executive Health Officers of Ontario, held at Owen Sound, Aug. 19-21, 1890.
Eighth Annual Report of the Provincial Board of Health of Ontario, being for the year 1889.

Buchanan, M. D., George, Whitehall, London, Eng.:—

Nineteenth Annual Report of the Local Government Board of England, 1889-90,—Supplement containing the Report of the Medical Officer for 1889.

Bugbee, C. A., Cheboygan, Mich.:—

Transactions of the Michigan State Pharmaceutical Assoc. at its meeting at Saginaw Sept. 16-18, 1890.

Bureau of the American Republics, Washington, D. C.:—

Hand-Book of the American Republics, Bulletin No. 1, January, 1891.

Hand-book of the American Republics, February, 1891.

Bureau of Education, Washington, D. C.:—

History of Education in Alabama, 1702-1889, by Willis G. Clark. The Teaching and History of Mathematics in the United States. School Hygiene or the Laws of Health in Relation to School Life.

Burr, M. D., Colonel B., Pontiac, Mich.:—

Report of the Board of Trustees of the Eastern Michigan Asylum for Insane at Pontiac, two years ending June 30, 1890.

Burrows, J. G., Richmond, Australia:—

Diseases which should be prevented, by James Jamieson, M. D. Fifteenth Annual Report of the Australian Health Society, 1889-90.

California State Board of Health, Sacramento:—

Eleventh Biennial Report of the State Board of Health of California, fiscal year ending June 30, 1890.

Cantwell, M. D., A. W., Davenport, Iowa:—

Annual Report of the City of Davenport, Iowa, year ending March 1, 1891.

Carter, A. Robert, Baltimore, Md.:—

Annual Report of the Health Department of the City of Baltimore, Fiscal year ending December 31, 1891.

Celli, Prof. Angelo, Rome, Italy:—

Annali dell' Interno Instituto D' Igiene Sperimentale Dell' Universita di Roma.

Intorno a Recenti Lavori Sulla Natura della Causa della Malaria.

Il Reperto del Sangue Nelle Febbri Malariche Invernali.

Sulle Febbri Malariche Predominanti Nell' Estate E Nell' Autunno in Roma.

Chancellor, M. D., Charles W., Baltimore, Md.:—

Special Report on the Prevalence of Typhoid Fever or Enteric-Miasmatic Fever at Cumberland, Md.

Eighth Biennial report of the State Board of Health of Maryland, two years ending Dec. 31, 1889.

A Health Code for Towns and Villages in the State of Maryland.

Chapin, M. D., Charles V., Providence, R. I.:—

Thirty-fifth Annual Report upon the Births, Marriages, and Deaths in the City of Providence, year 1889.

Seventh Annual Report of the Superintendent of Health of the city of Providence, year ending Dec. 31, 1889.

Christian, A. B., M. D., E. P., Wyandotte, Mich.:—

Cow's Milk and Typhoid Fever.

Christie, M. A., F. R. S., Wm. H. M., Greenwich, England:—

Results of the Spectroscopic and Photographic Observations made at the Royal Observatory, at Greenwich, for the year 1888 and for the year 1889.

Chief of the Bureau of Statistics, Washington, D. C.:—

Quarterly Report of the Chief of the Bureau of Statistics, relative to Imports, Exports, etc., Quarter ending June 30, 1890.

Annual Reports and Statements of the Chief of the Bureau of Statistics on the Foreign Commerce, Navigation, Immigration, etc., fiscal year June 30, 1890.

Quarterly Report of the Bureau of Statistics, Treasury Department, relative to Imports, Exports, etc., three months ending June 30, 1890.

Quarterly Report of the Bureau of Statistics, relative to Imports, Exports, etc., of the U. S., quarter ending Sept. 30, 1890.

Quarterly Report of the Chief of the Bureau of Statistics, relative to Imports, Exports, etc., Quarter ending Dec. 31, 1890.

Chief U. S. Weather Bureau, Washington, D. C.:—

Annual Report of the Chief Signal Officer of the U. S. Army to the Secretary of War for the year 1889—Parts I and II.

Annual Report of the Chief Signal Officer, year 1890.

Chief Signal Officer, Washington, D. C.:—

Tri-daily Meteorological Record, from Jan. to Dec. 1878.

Collamore, Dr. G. A., Toledo, Ohio:—

Annual Report of the Board of Health of Toledo, Ohio, year ending Dec. 31, 1890.

College of Physicians and Surgeons, Philadelphia, Penn.:—

Report of the Board of Health of State of Louisiana to the General Assembly for year 1882 and first 6 mos. of 1883.

Commissioner of Health, Marseilles, France:—

Bulletin Démographique Mensuel: Publié par la Commission Sanitaire Municipale a Marseilles, 1889.

Commissioner of Railroads, Lansing, Mich.:—

State of Michigan—Police Regulations.

Conn, M. D., G. P., Concord, N. H.:—

Transactions of the New Hampshire State Medical Society at Concord, June 16 and 17, 1890.

Connecticut State Board of Health, New Haven:—

Thirteenth Annual Report of the State Board of Health of Connecticut, Year ending Nov. 30, 1890.

Offices of the Local Boards of Health in Towns, Cities and Boroughs in Conn.

Crampton, Dr., C. A., Washington, D. C.:—

Annual Address of the President of the Chemical Society of Washington, Jan. 22, 1891.

Curtis, F. C., Albany, N. Y.:—

Transactions of the Medical Society of the State of New York, for the year 1890.

Davis, Dr. Paschal, Keokuk, Iowa:—

Fifth Annual Report of the Board of Health of the City of Keokuk, Iowa, year ending March 31, 1891.

Dawson, Martin, Chicago, Ill.:—

Proceedings of the Seventh Annual Convention of the National Confectioners' Association, held at Niagara Falls, July 8 and 9, 1890.

Denza, Francesco, Rome, Italy.:—

Regolamento della Specola Vaticana.

Publicazioni della Specola Vaticana, Fascicolo I.

Dewey, Ph. D., Davis R., Boston, Mass:—

Publications of the American Statistical Association, Nos. 11 and 12, Sept.-Dec., 1890.

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Sewerage and Sewage Utilization, by W. H. Corfield, No. 119.
Drainage of a House, by W. P. Gerhard.
How to Prevent the Fouling of Water Sources, No. 6679.
The Sanitation of Cities and Towns, by C. W. Chancellor, No. 5877.
The Sewage Question, No. 166.

BY A. M. MILLER, M. D.

Sanitary News, 1889.—May 4, 11, 18, 25; June 1, 8, 15, 22, 29; July 6, 13, 20, 27; Aug. 3, 10, 17, 24, 31; Sept. 7, 14, 21, 28; Oct. 5, 12, 19, 26; Nov. 2, 9, 16, 23, 30; Dec. 7, 14, 21, 28; and for 1890, Jan. 4, 11, 18, 25; Feb. 1, 8, 15, 22; March 1, 8, 15, 22, 29; April 5, 12, 19, 26; May 3.
Study of Hygiene, Public and Other Schools, by Chille, No. 2854.
Hygiene, etc., Health and Social Science, by Hunt, No. 4146.
Sanitary Progress in Michigan, by Hueston.

BY DR. JAMES D. MUNSON.

Billings on Ventilation.

BY DR. J. S. PARDEE.

Trans. of the Med. Soc. of New York, No. 6115.
Popular Science Monthly. Vol. 14, 1879, No. 1593.
Maryland Med. Jour., Vol. 19, 1888, No. 7548.
The Oatmeal Question.

BY DANIEL A. PELTON.

Dictionary of German Med. Terms, No. 4372.
Foster's Practical Physiology, No. 706.
Braun's Atlas of Topographical Anatomy, No. 1025.
Wood's Reference Hand-Book, No. 6687.

BY CHARLES F. RUGGLES.

Curative Effects of Baths, by Braun, No. 131.
Popular Science Monthly, Vol. 12, No. 1591.

Medical Record, Vol. 18, No. 1587.
London Lancet, July-Dec., 1883, No. 4580.
Scientific American, Supplement, July 9, 1887.

BY ROBERT SMITH.

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Medical Counselor, Vol. 9, 1885.
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Weekly Medical Review, Vol. 14, 1886.
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Jour. Franklin Institute, Vol. 124, 1887.
American Microscopical Jour., Vol. 6, 1885.
Columbus Medical Jour., Vol. 1, 1883.
Centralblatt für Bakteriologie und Parasit, Band VIII., 1890.

BY VICTOR C. VAUGHAN.

Annals of Hygiene, Nov., 1887.
Monthly Sanitary Record, Vol. 1, Feb. No.

BY DR. C. L. WILBUR.

Diseases of Children, by Smith, No. 665.

BY GEO. E. WILLITTS.

Annual Report of the Registrar-General of England, year 1888, No. 7412; year 1855, No. 205, and year 1868, No. 210.
Twenty-fifth Annual Report of the Sanitary Commissioner of Government of India, 1888, No. 7413.
Report of the Health Officer of Calcutta, 1888, No. 7235.
Popular Science Monthly, Vol. 29, 1885-6, and Vol. 29, 1886.
Popular Science Monthly, June, 1890.
Climate and Time, by Croll, No. 187.
Progress of Preventive Medicine, by R. Thorne Thorne.

PAPER ON HAND.

The following table shows the amount and kind of paper there was on hand at the time of making the last report, the amount purchased during the year, the amount used, and the amount now on hand:

Kind of paper.	On hand at last Report.		Purchased since last Report.		Used during the fiscal year.		On hand June 30, 1891.	
	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.	Reams.	Sheets.
Flat	6	....	....	....	2	238	3	242
Crown	2	260	13	....	14	218	1	42
Folio Post	20	252	27	....	27	377	19	355
Demy	4	212	....	....	....	48	4	164
Medium	1	147	....	....	....	236	....	391
Byron Weston	....	150	....	....	....	....	....	150
Foolscap	1	330	....	....	....	180	1	150
Legal cap	1	340	....	....	....	100	1	240
Blotting paper	....	70	....	....	....	39	....	31
Blue cover paper	7	....	....	....	4	270	2	210
Postoffice paper	1	250	....	....	....	10	1	240
Book paper	....	....	2	....	....	....	2	....
Manilla wrapping paper	4	212	4	....	3	362	4	330

There are now on hand 5,625 sheets of hard paper of half letter size, 217 sheets of note paper, and 200 sheets of one-half note size.

There were about 114,791 envelopes on hand at the time af making the last report; 40,000 of the various kinds used in the office have been purchased since, making a total of 154,791. There are now on hand 48,255 printed envelopes, and 69,309 blank envelopes, making a total of 117,564. About 37,227 have been used in the work of the Office.

Vouchers for postage (for use in the office) have been allowed during the year to the amount of $1,150.00. The cost of postage during the fiscal year has been $938.66, as follows:

Distribution of Annual Reports	$167.42
General distribution of documents and circulars	266.44
Sending weekly and monthly bulletins	36.85
Collection and dissemination of statistics and information in regard to communicable and other diseases	57.06
Sending announcements and programs for sanitary conventions	43.34
Sending meteorological material to observers	5.19
Regular and special correspondence of the office, and all other postage (including a considerable amount for distribution of documents on the restriction of diphtheria, scarlet fever, and typhoid fever, to localities where those diseases occurred)	362.36
Total	$938.66

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE BOARD OF HEALTH, AS PER VOUCHERS 1906–2027 INCLUSIVE (EXCEPT NUMBER 1958), ALLOWED DURING THE FISCAL YEAR ENDING JUNE 30, 1891.

Chemical analyses	$30.00
Engraving, drawing, etc.	----------
Expenses of members:—	
Attending meetings	72.25
Other official	628.36
Instruments and books	240.75
Paper, stationery, etc.	300.91
Postage:—	
Office	900.00
Members	----------
Printing and binding	801.05
Secretary	2,500.00
Special investigations	----------
Miscellaneous	27.00
Total	$5,500.32

Respectfully submitted,
HENRY B. BAKER,
Secretary.

EXPENDITURES BY THE STATE BOARD OF HEALTH IN THE CALENDAR YEAR, 1890.

The foregoing is reported, in compliance with law, relative to the fiscal year. But the appropriations for the Board are for the calendar year, and they amount to six thousand dollars. The expenditures for any calendar year, therefore, cannot exceed six thousand dollars. The following is a classified statement of expenditures for the calendar year 1890:

CLASSIFIED STATEMENT OF EXPENDITURES BY THE BOARD DURING THE CALENDAR YEAR, 1890.

Chemical analyses	------------
Engraving, drawing, etc.	$170.00
Expenses of Members:—	
Attending meetings	47.50
Other official	696.67
Instruments and books	278.18
Paper, stationery, etc.	372.31
Postage:—	
Office	904.00
Members	------------
Printing and binding	780.12
Secretary	2,500.00
Special investigations	------------
Miscellaneous	419.38
Total	$5,999.86

EXPENDITURES ON ACCOUNT OF THE BOARD.

The appropriations ($6,000) at the disposal of the State Board of Health are for certain specified purposes, not including clerk hire, the publication of the annual report, or the expenses in the examinations of plans for public buildings; these expenditures *on account of* but not by the board are provided for by other acts of the legislature than those appropriating money to be expended by the board, and the accounts are kept in other offices, not in the office of the board of health; the accounts for clerk hire are kept by the Auditor General, and reported in his annual report; the accounts for publication of the annual reports, and for expenses in the examinations of plans for public buildings, are kept by the Board of State Auditors, and are published in the Annual Report of that Board.

Respectfully submitted,

HENRY B. BAKER,
Secretary.

THE RESTRICTION OF DIPHTHERIA IN THE CITY OF HOLLAND.*

BY HENRY B. BAKER, M. D., SECRETARY OF STATE BOARD OF HEALTH, LANSING.

MR. CHAIRMAN, LADIES AND GENTLEMEN: In response to an invitation from your board of health, I am here as a member of the State Board of Health to aid your city board, by placing before you what we believe are the best means to restrict and prevent diphtheria.

This implies, and it is true, that diphtheria can be restricted and prevented. I am here to assure you, and to prove to you that diphtheria can be restricted by measures which we can mention in three words—*isolation and disinfection.* You all know what we mean by disinfection; it is the destruction of all infection. A little later I will describe the most approved methods of disinfection. By "isolation" we mean the entire separation of the person who is sick with diphtheria, and of every person who is exposed to the sick person so as to be infected with the "germs" of the disease—their absolute separation from the public, from everyone liable to take the disease. If every person taken sick with diphtheria is promptly isolated and kept isolated until free from infection, and then, if everything about that person and around the premises is thoroughly disinfected, the disease will be restricted; it will not spread. If these two measures are not taken it is very likely that it will spread. I have here the proof of this: Here is a diagram exhibiting the average results of the experiences in Michigan under both these conditions. In the first columns are shown the average numbers of cases and deaths *per outbreak* in all outbreaks in which isolation and disinfection were "neglected;" and in the last columns are shown the average numbers of cases and deaths *per outbreak,* in all outbreaks in which isolation and disinfection were "enforced." You can see for yourselves the very great difference. Taking the facts reported for a series of years, the evidence seems to prove that

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Holland, Mich., July 8, 1890.

* "DR. H. B. BAKER, *Secretary State Board of Health:*

"DEAR SIR:—At a meeting of the Board of Health of the city of Holland, the following resolutions were adopted:

"*Resolved,* That a public meeting of the citizens of Holland be called by the local Board of Health for the purpose of enlightening the people of the city upon the subject of diphtheria, and that the members of the State Board of Health be invited to attend such meeting, and address the citizens.

"*Resolved further,* That such meeting be called at the earliest possible time, and that the health officer be instructed to at once correspond with the Secretary of the Board.

"You see from this that you are invited to come at the earliest convenience. Please let me know before Sunday. Next week Thursday or Friday will be convenient for us. Meeting to open at 7:30 P. M.

"Yours,

"H. KREMERS, M. D."

After consultation of the members of this Board, it was decided that Drs. Hazlewood, Avery and Baker should go to Holland to aid the citizens in the restriction and prevention of diphtheria which was then very prevalent in that city. A public meeting was called for Thursday evening, July 17, 1890, at 7:30 P. M. and was addressed by Dr. Avery, president of the State Board of Health, Dr. Hazlewood, of Grand Rapids, member of the State Board of Health, the Mayor of the city of Holland, and others. Among the addresses and papers read was one by Dr. Henry B. Baker, Secretary of the State Board of Health, which, by direction of the Board, is here printed in this Report.

in those outbreaks of diphtheria in which isolation and disinfection are neglected there are at least five times as many cases and five times as many deaths as there are in those outbreaks in which isolation and disinfection are enforced. This is the same as saying that by isolation and disinfection diphtheria may be restricted, immediately after it has come to a locality, so that four-fifths of the cases which would occur if it were not restricted will not occur, that is to say four-fifths of the cases can be prevented by restricting the first cases in the outbreak.

Diagrams which are distributed to this audience exhibit this evidence. The diagrams are accurately drawn to a scale; and they have been carefully prepared from official reports made by local health officers throughout this State. I think you can rely upon these diagrams as exhibiting the truth on this subject, namely, that at least four-fifths of the cases and deaths from diphtheria can be prevented by restricting first cases—by isolation and disinfection.

CO-OPERATION NECESSARY FOR THE RESTRICTION OF DIPHTHERIA.

How can this exceedingly important isolation and disinfection be had? In order to accomplish this, it is necessary that all the people shall coöperate. No person can fully protect himself or his family so long as others do not understand the subject and act accordingly. Therefore, the only way this exceedingly dangerous disease can be most completely avoided by any of us is by increasing the proportion of the people about us who know how to restrict and prevent diphtheria. That, I suppose, is the reason why this public meeting has been called,—in order that all the people shall come to understand this subject, and that all shall do their best to stamp out this dread disease.

Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease, keeping away until everything has been disinfected. In order that this shall be possible it is essential that every place where diphtheria is shall be promptly reported to the health officer, and plainly placarded. The law requires the local board of health to "give public notice of infected places," and to "use all possible care to prevent the spreading of the infection." Another law requires the health officer to "give public notice of infected places by placard on the premises, and otherwise if necessary." Common humanity requires of every person that he do his utmost to fulfill the letter and spirit of all such laws for the public safety against such a terrible disease as diphtheria.

The law was amended at the last session of the legislature, and its provisions should be generally known. Every householder, hotel keeper, keeper of a boarding house or tenant is required to report, to the local health authorities, diphtheria and any other disease dangerous to the public health, and whoever fails to do this is liable to a fine and to imprisonment if the fine is not paid. Physicians are required to report, and if the physician reports the householder is excused from that duty. Health officers, unless otherwise ordered by the local board of health, must take prompt, thorough, and efficient measures to stamp out the disease; and if they neglect their specified duties they are liable to a fine and to imprisonment if the fine is not paid.

But however good the laws may be, their execution depends upon the enlightened sentiment of the locality, upon the people themselves, from whom the prompt notice should go to the local health officer, and upon intelligent and faithful local officers who should perform duties which are of the highest importance to the people. For obvious reasons, the compensation of the health officer should be greater than he can obtain for the same time by the regular practice of his profession as a physician,—the highest interests of the public demand that he shall have a greater money interest in the prevention of sickness than in the treatment of sickness which should have been prevented.

No locality can do much to stamp out diphtheria unless it has an efficient local health officer; and no locality should expect to have the services of such an officer unless it pays more for such service than has been customary. I think it is just as wicked for the people organized into a city to try to get "something for nothing" as it is for an individual to do the same thing; and if the individual is caught getting "something for nothing" he is sent to jail or State prison. I submit this idea to your local board of health, or to whatever officers in this city control the salary of the health officer, and the expenditures necessary for the isolation and disinfection of dangerous diseases.

There is one more requirement for the restriction of all of these dangerous diseases. It is a delicate point to mention, but it is important that the physicians around the State shall be able to know one of these diseases when they treat it. The fact is, that in each of the outbreaks of smallpox in recent years that have spread, the doctor called to treat the disease did not recognize it—called it chicken pox. It is a common thing for scarlet fever and diphtheria to be treated as some harmless ailment, and consequently be allowed to spread. Typhoid fever is, sometimes, not recognized and reported to the health officer. All this indicates that the greatest safety of the people would require that all who advertise or set themselves before the people as practitioners of medicine should have certain qualifications,—they should be required to know the characters of the most common and most fatal diseases, especially those which are communicable and which therefore always endanger the public.

If you think as I do on this subject you can ask the legislature to give you such a law. My own duties are mainly with the execution of laws, but in the performance of those duties we sometimes see or think we see how the laws might be improved.

FACTS USEFUL FOR AIDING THE RESTRICTION OF DIPHTHERIA.

There are some facts concerning diphtheria which it is important that all our people should know.

About eighty-five per cent of all the deaths from diphtheria are of children under ten years of age. Grown people have diphtheria, but in grown people it is usually considered only an ordinary "sore throat," and proper precautions to prevent the spread of the disease are not taken.

It should be generally known that it is not always possible for any physician to recognize diphtheria, especially in a grown person. The State Board of Health has passed resolutions as follows:

IN ALL CASES OF SORE THROAT PRECAUTIONS SHOULD BE TAKEN.

Resolutions adopted by the Michigan State Board of Health, January 10, 1888:

WHEREAS, It is often difficult to recognize mild cases of diphtheria, or to distinguish such cases from a simple tonsillitis, pharyngitis, or laryngitis; and

WHEREAS, Such mild cases of diphtheria often communicate a dangerous and fatal form of diphtheria;

Resolved, That it is the duty of physicians and householders in reporting diseases dangerous to the public health, and of local health authorities, in their efforts to restrict such diseases, in every case, to give to the public safety the benefit of the doubt; and in localities where diphtheria exists, to regard cases of acute sore throat as suspected cases of diphtheria:

Resolved, That suspected cases of dangerous diseases should be reported and precautionary measures should be taken.

February 7, 1889, the following was unanimously adopted:

WHEREAS, It is often impossible to discriminate between cases of diphtheria and membranous or inflammatory croup; and

WHEREAS, Modern researches point to a probable common origin of these diseases;

Resolved, That in the opinion of this Board membranous or inflammatory croup should be classed with diseases communicable and dangerous to the public health and should be reported as such and the same precautions should be taken in cases of this disease, as regards isolation and disinfection, as in cases recognized as diphtheria.

THE CONTAGIOUSNESS OF DIPHTHERIA.

Copies of a pamphlet [106.], issued by the State Board of Health, on the "Restriction and Prevention of Diphtheria," are here for distribution to everyone who wants a copy. I wish every person here would take one home, read it carefully, and preserve it for future reference. It contains carefully-prepared instructions as to what is required by law, how to act when the disease occurs in a house, how to disinfect after the patient has recovered, and a diagram on the last page gives the practical results of the experiences in Michigan in the isolation and disinfection of persons and premises infected with diphtheria.

In this pamphlet the first statement is that "Diphtheria is a Dangerous Contagious Disease." My own view is that diphtheria is probably more contagious than small-pox. The evidence for this is that the spread of diphtheria is not usually so easy to trace,—diphtheria seems to be more frequently spread by indirect means than small-pox is; because if it were not, we ought to be able to trace the spread of diphtheria as easily as we do the spread of small-pox. We can usually trace a case of small-pox or measles directly to a previous case, which means that these diseases are not usually spread by very indirect means. The facts seem to prove that diphtheria is more contagious, or rather that its contagious principle clings more tenaciously to persons and things or it is conveyed more by persons and things in ways not suspected. I have pointed out one way, namely, by the "sore throats" of adult persons who do not know that they have the disease. Cases are reported to the State Board of Health as occurring "in the same house where diphtheria was a few months ago," and "in the same house where diphtheria was one year ago." The disease sometimes breaks out again at the same season of the year as when it was first present, perhaps because the same clothing then again comes into use.

Every room in which there has been a case of diphtheria should be thoroughly disinfected, as also should all clothing worn or bed clothing used by a person sick with diphtheria.

DIPHTHERIA MAY BE SPREAD BY ANIMALS.

There are three ways in which it is probable that diphtheria may be spread by animals. 1. By their carrying the "germs" of the disease in their hair or fur. 2. By their having the disease. Thus recent experiments show that cats exposed to the infection of diphtheria have pneumonia. Probably they may thus spread diphtheria. 3. Recent experiments seem to prove that cows inoculated with diphtheria give milk which contains the diphtheria baccilus, the "germ" of the disease. This may explain one of the indirect means by which diphtheria is spread.

LOCAL CONDITIONS.

All these modes of spread imply the existence of a first case. We know of no way whereby diphtheria can be created or generated by local conditions except by spreading from a previous case.

Some years ago Mr. Erwin F. Smith, employed by the Michigan State Board of Health, made a thorough investigation of this subject. He could not find evidence that local conditions had any part in the causation of diphtheria.

The diagrams distributed here exhibiting the experience of health officers throughout this State seem to prove that four-fifths of the cases of diphtheria are prevented by isolation and disinfection. This could not be possible if diphtheria were caused by local unsanitary conditions. It is proof positive that diphtheria is a communicable disease. And if four-fifths of the cases are spread from first cases, it is extremely probable that the other fifth are spread from previous cases.

DIPHTHERIA IS ONE OF THE MOST DANGEROUS DISEASES WE HAVE IN MICHIGAN.

According to the vital statistics published by the Secretary of State there is only one disease that causes more deaths in Michigan than diphtheria does. Diphtheria causes the death of hundreds in every year, the average being, probably, more than two thousand. The black diagrams "Deaths in Michigan, 1876–87," distributed here this evening, show you the relative importance of diphtheria and small-pox. The diagram is accurately drawn to scale, and correctly represents the proportion of deaths from small-pox, from diphtheria, and other dangerous communicable diseases. You will see that diphtheria causes about seventeen times as many deaths as small-pox does.

PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA IN MICHIGAN.

Much of the experience with diphtheria in Michigan is reported to the State Board of Health by the local health officers; the reports are compiled; tables and diagrams are made exhibiting the results, as is done in the diagrams for some of the years, distributed here this evening. By multiplying all the outbreaks reported by the average number of cases and deaths which occurred in these outbreaks in which isolation and disinfection were neglected, we learn the probable number which would have occurred if isolation and disinfection had been neglected in all the outbreaks. Then, if we subtract from these numbers the numbers which actually occurred we learn the probable saving of cases and deaths by the isolation and disinfection. We thus learn that in 1886, 833 lives were saved and 4,374 cases of sickness from diphtheria were prevented; in 1887, 518 lives were saved, and 2,371 cases prevented; in 1888, 416 lives were saved and 3,292 cases prevented. During the three years, over ten thousand cases of sickness were prevented, and more than seventeen hundred lives were saved from diphtheria in Michigan, by isolation and disinfection. Another way of stating this is that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day. Is not this a noble work? And, will you not all join with us in this work?

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A STUDY OF THE ACTION OF ALCOHOL ON THE HUMAN BODY.*

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICHIGAN.

The special work assigned to the writer, as a member of the State Board of Health, is school hygiene; and it is in furtherance of that work that the following paper is offered. Its purpose is two-fold: (1) to present some of the facts concerning the action of alcohol upon the various tissues of the human body; and (2) to illustrate a method of approach and treatment of the subject such as may be used by teachers who have under their instruction scholars of the grade usually found in our grammar and high schools.

Before proceeding with the subject certain conditions will be insisted upon which, according to the opinion of the writer, are quite essential to the proper enlistment of the scholars' interest in the subject:

(1) The teacher must lay aside all sentiment, both in manner and in words. This subject demands the same cold, critical, scientific treatment that every other question in science receives. For the teacher to have it known that he treats this subject simply from the standpoint of a political prohibitionist or ardent temperance worker would be to so prejudice the work as to largely destroy the results which are aimed at.

(2) On the other hand, the scholar himself must have passed beyond that stage of his observation of the results of rum's doings that simply makes sport of the drunken man, deriving pleasure and making such a man serve as the occasion for fun and frolic. It would be well if the scholar should set himself the task of seriously and carefully observing for himself those facts which are apparent when he comes face to face with one of the victims to the alcohol habit. Let the scholar note, then, the staggering gait, the rolling eyeballs, the bleared and blood shot eyes, the voluble tongue, the rum-blossomed nose; the loss of judgment, of honor, of purity; the drunken stupor, etc., etc., and with his mind full of these facts he will be in a condition to heartily appreciate the work set before him.

Can the real, the scientific reasons for this condition of things be understood clearly by the pupils in our schools? It will be our aim to show that this can be done.

What is the action of alcohol on the system?

This question naturally divides itself into two parts which must be treated separately.

The first concerns those investigations which will make plain the merely physical action of alcohol on the body; the other those considerations which reveal the value of alcohol as a food.

ALCOHOL MAY BE INTRODUCED INTO THE SYSTEM

in several ways; it may be injected through the skin, it may be inhaled by the lungs, or it may enter the stomach by means of the mouth. By all these methods the alcohol will finally make its way into the circulation and by it be distributed to every part of the body. If injected under the skin or into a vein it is quickly absorbed by the minute lymphatics and by them passed into the circulation at the point where the great vein from the arm, the subclavian, joins the vein in the neck, the jugular, thence into the descending vena cava, and onward into the heart.

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* Read at the Sanitary Convention at Lapeer, Mich., March 27 and 28, 1890; and, by direction of the State Board of Health, is printed in this Report.

If the alcohol is in a state of vapor and inhaled by the lungs, osmosis quickly takes place, and the alcohol passes from the air-cells into the pulmonary capillaries and is by them conducted to the pulmonary veins, and thus on to the heart.

But the usual avenue of ingress into the body is by way of the mouth and stomach. Portions of the alcohol are here quickly absorbed by the dense matting of blood capillaries lining the mucous membrane of that organ and by them passed into the great portal vein leading to the liver. Passing through this it makes its way into the ascending vena cava, the right heart, the lungs, back to the left heart, and thence through the aorta and its divisions into all parts of the body. Thus it is seen that this fluid finally comes in contact with every organ of the body, it bathes every tissue, it lays tribute upon every nook and cranny of the human system.

Having now studied the course of the blood and hence the alcohol through the system, let us pass on to inquire as to the effects which are produced on the various tissues and organs with which it comes in contact.

ACTION ON THE BLOOD.

Plainly among the first things to be influenced will be the blood itself. If the alcohol is in small quantities it may be diluted to such an extent by the large percentage of water present in the blood as to render it powerless to effect any visible change in the blood. But its effects when in large quantities, as it exists in the blood of the confirmed drunkard, are well-known.

In order that we may clearly understand what this action is we must recall the structure and component parts of human blood.

It will be remembered that the blood on first examination is seen to be composed of a clear, watery fluid, the plasma, and floating in this, myriads of small, round, biconcave bodies, the corpuscles. The plasma is in turn composed of albumen, fibrin,—which aids in the process of coagulation—fatty matters and salts of several metals. Now, various experiments have been made, such as administering alcohol to a frog and observing the effect on the blood as seen in actual circulation in the web of the foot, or withdrawing blood from the veins of a man in the state of intoxication; so that the pathological effects are well known.

The action of the alcohol upon the corpuscles is very striking. It may cause them to roll together closely and to continue to adhere, a condition never seen until the blood has begun the process of coagulation.

Here is our explanation for the sluggish flow of the blood in the capillaries of the drunken man, the corpuscles not being able in the closely adhering rolls to make their way through these minute circulatory organs.

Moreover the corpuscles are seen to have their outlines modified, making their smooth and regular outline to be wrinkled and the whole form star-like. These changes are brought about by the power which alcohol has of absorbing or extracting water. We are familiar with the power which a sponge possesses of accommodating great quantities of water between the particles of its own structure. A cloth or piece of paper will do the same. We are not so familiar with the same effects produced by a liquid, but alcohol and some other liquids possess it in a high degree. It is on this principle that specimens for our museums are preserved, which otherwise would be perishable on account of the large amount of water they contain. They are plunged into a jar of alcohol, the water is thereby withdrawn and the specimens preserved. We are now prepared to clearly understand one action of alcohol on the system, viz., alcohol withdraws water from the blood corpuscle and thus shrinks and hardens it, rendering it wholly unfit to carry out its natural functions of absorbing oxygen and conveying it to the various tissues of the body.

As to the action of alcohol on the liquid portions of the blood I quote from Dr. B. W. Richardson:

"A further action upon the blood instituted by alcohol in excess is upon the fibrin and albumen. On this the spirit may act in two different ways, according to the degree in which it affects the water that holds the fibrin in solution. It may fix the water with the fibrin, and thus destroy the power of coagulation; or it may extract the water so determinately as to produce coagulation. These facts bear on a new and refined subject of research with which I must not trouble you further, except to add that the inquiry explains why in acute cases of poisoning by alcohol the blood is sometimes quite fluid and at times firmly coagulated in the vessels." *

Let us now pass to the study of the

ACTION OF ALCOHOL ON THE BLOOD VESSELS.

As before, we must have before our minds a clear conception of the structure and functions of these organs.

Picture them, each for himself, the heart, the central circulatory organ and force pump of the system, an organ of small dimensions but of great power, situated in the lower part of the chest; from this arises that great artery, the aorta, which in turn divides and subdivides until portions of it have ramified into all parts of the system as if indeed these organs formed the framework round which all the rest of the body was disposed. These arteries as they have thus divided and subdivided have continually grown smaller and smaller until they terminate in a set of minute organs so small as only to be visible by the aid of a microscope, the capillaries. These in their turn open into the small beginnings of the veins which, ever enlarging, finally convey the blood back to the heart itself.

These capillaries, small as they are, are very highly organized and have clearly defined functions. They are muscular and in common with all muscles have the power to contract; by this contraction aiding to force the blood along in its passage through them.

And it must not be forgotten that these organs, small and refined as they are, are not left to chance as to the time or force of their muscular contractions, but are as efficiently and constantly governed in their movements as any organ of the body; that is to say, for every portion of every small capillary there is a nerve which supplies the proper stimulus at the proper time for its action. This necessitates a brief

STUDY OF THE NERVOUS SYSTEM.

If we study the anatomy of some of the lower animals, as the earth-worm or grasshopper, we shall find that for every segment or division of his

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* Ten Lectures on Alcohol, p. 78.

body there are two small masses of gray nervous matter constituting for that segment a double brain for its proper governance and control. Proceeding outward from these ganglia are nerves running into all parts of the segment. This constitutes the entire nervous system of the lower animals and in man we find exactly the same thing except that besides this, he, in common with all vertebrated animals, has superadded another great nervous system, consisting of brain, spinal cord, and the cranial and spinal nerves.

I have thus characterized what you are all doubtless familiar with, the two nervous systems found in man, united to each other and yet very distinct from each other, both structurally and functionally. The former is the sympathetic and the latter the cerebro-spinal system. It is the sympathetic, or as it is sometimes called, the organic or vegetative system in which we are now particularly interested, as it is this system which governs the capillary blood vessels. Now the great harm produced in the blood vessels by alcohol comes to them through its action on these nerves. What the action is may be understood by

AN EXPERIMENT.

If I place some ether on my hand and cause a current of air to pass over it, it quickly evaporates and chills the skin. My hand thereby becomes numb or paralyzed, the nerves distributed to that part having been thus affected by the ether. Notice what follows: the nerves being no longer able to act, the capillaries will not contract and hence become permanently enlarged. This super-abundance of blood renders it hot and inflamed. Blushing and pallor in the face are to be described in much the same way. Ether is chosen in this experiment because its action is more rapid and more marked than alcohol. The latter produces the same results only differing in degree, and the experiment has therefore correctly taught us the action of alcohol on the small blood vessels, and we are now prepared to state what that action is, viz.: alcohol paralyzes the nerves distributed to the capillary blood vessels and they thus become abnormally dilated with the flowing blood. In connection with the foregoing, one fact should be kept in mind, and that is, that the phenomenon here described is brought about with the introduction of even a moderate amount of alcohol.

The action of alcohol does not stop here. The disturbance of equilibrium in the capillaries produces an

INCREASE OF THE HEART BEATS.

The heart when the circulatory apparatus is in its normal condition meets a certain and uniform resistance which tempers and times the rate of its pulsations. When the capillaries become permanently enlarged, in consequence of the paralysis of the organic nerves, the heart must increase the number of beats in order to meet the new demand. Thus like a clock, from which the regulating pallets have been removed, the beat of the heart is faster and faster as long as alcohol is introduced within the body.

The rate of increase of heart beats has been carefully and accurately computed and found to be an average increase of about 13%, or, adopting another form of putting the case and quoting again from Dr. Richardson,* "The lowest estimate which has been given of the daily work of the heart, viz., as equal to 122 tons lifted one foot high, the heart during the period in which alcohol was administered, did daily work in excess equal to lifting 15.8 tons one foot, and in the last two days did extra work to the amount of 24 tons lifted as far." Moreover,

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* Ten Lectures, p. 57—Researches of Dr. Parkes.

THE PERIOD OF REST OF THE HEART WAS SHORTENED.

We do not ordinarily think of the heart as needing or taking any rest, but like all other parts of the human mechanism it must have rest or finally its powers are gone, it flags in its action, and finally will wear out altogether.

Let it be plainly and emphatically enforced that the conditions and effects here described are those consequent upon the first introduction of alcohol into the system. It may be called the first stage in the alcoholic effects.

Let it also be enforced that these external phenomena of flushed face and more rapidly beating heart are but the signs of a serious derangement which is being accomplished all over the system. The young man is apt to think and act as though these were all the evils accomplished and that these would easily and quickly right themselves. This is not so: if the lungs could be seen they would show the same unnatural injection of an oversupply of blood, the brain and spinal cord would be seen to be surcharged with blood; the liver, kidneys, spleen, the stomach, would all show the same unnatural condition. Just here the greatly increased thirst of the drinking man can easily be understood. This enlargement of the capillary blood vessels all over the system calls for more blood than the system contains or can supply, and the supply is made up by an excess of liquids of various kinds. By this the blood is thinned and impoverished and the system degraded.

IN THE NEXT STAGE

the spinal cord comes under the blighting influence of the alcohol and its functions become impaired. The spinal cord has a dual function; it not only conveys impressions received through the nerves to the brain, but it also frequently arrests them and transmits back the impulse for motion necessary for the carrying out of some of the minor movements of the body. For example, I may walk along the street and at the same time carry on an animated conversation with the friend who accompanies me. Now, every movement of the foot is brought about only when the proper impulse has been given it through the nervous system. Plainly, if the brain were obliged to attend to each movement of the foot, there would be no time for accurate thinking or coherent conversation. Physiologists have learned, then, that the spinal cord has the important function of reflex action by which certain minor matters are relegated to it, leaving the brain free for the higher duties. But under the action of alcohol these spinal centers finally become so deranged that they are not capable of correctly bringing about these automatic acts. More and more the commonplace acts of walking, the use of the hands, the movements of the muscles of expression, the muscles controlling the eyes, etc., all of which should be governed by reflex action, require the action of the brain itself. This unnatural taxing of the brain quickly results in

A LACK OF THE POWER OF COÖRDINATION

of the movements of the body. It is said "that the muscles of the lower lip in the human subject usually fail first of all, then the muscles of the lower limbs." In the meantime the muscles are becoming weak and flabby, and slow and feeble in their action. The staggering gait and retching and vomiting close another stage of alcoholic effect.

A third stage quickly follows in which the brain centers themselves becoming overtaxed, the will and judgment are temporarily dethroned, the higher and finer feelings give way to the baser passions, the naturally pure man becomes a defamer of his God, otherwise truthful lips give forth vile and false statements, the normally brave and courageous condition is exchanged for that of the foolhardy and irresolute, foolish words and ribald songs are the natural outgrowth of the man's condition.

The alcoholic appetite further indulged and its victim passes into

THE FOURTH AND LAST STAGE

in which he loses all control of nervous and muscular organs and falls down dead;—to all that makes him a man, actually dead with the exception of the faithful heart which ceases not its beating and hence prevents life itself from being dethroned.

But we must leave the consideration of the merely physical action of alcoholic drinks on the system for the discussion of another very important phase of the subject. We do not stop however, because of lack of material. It is a large subject. Every part of the body is diseased by this fell poison and every organ is affected in its own peculiar manner. So we have the hob-nailed or gin-drinker's liver, the fatty heart, the ulcerous stomach, the dropsical abdomen, the poisoned kindeys, giving rise to Bright's disease, the aneurism of the blood vessels, the congested lungs, etc. But the limit of this paper makes it altogether impossible to more than mention the names of diseases often the direct result of drunkenness,—dyspepsia, jaundice, emaciation, corpulence, dropsy, ulcers, rheumatism, gout, tremors, palpitations, hysteria, epilepsy, palsy, lethargy, appoplexy, melancholy, madness, delirium tremens, premature old age, etc., etc.

Is there any compensation for all this? I have reserved for myself a large part of this paper for the discussion of this question. The question is sometimes answered in the affirmative. When so answered it has been on the basis of the statement that in all alcoholic beverages there is a certain amount of nutrient matter, that is that alchohol is a food.

IS ALCOHOL A FOOD?

This brings us to the very heart of our subject, the pivotal point around which the great discussions have raged. All have conceded that dire and dreadful results have always flowed from an excessive use of alcoholic drinks; but after all is there not a moderate use of them possible, so moderate that the beneficial results will more than compensate for the few evils which necessarily accompany them?

In order to prepare ourselves for the discussion of this subject it will be necessary to briefly review the character and uses of food. The various foods we use may be primarily divided into inorganic and organic. The former will include those few mineral matters which the body of man seems to have the power to assimilate such as water, common salt, salts of calcium, magnesium, potassium, etc. Organic foods may be divided into three classes, the albuminous such as the white of the egg or the fibrin of meat, the saccharine or the starches and sugars, and the oleaginous or fats and oils. If we go further and consider their chemical composition we notice that while the saccharine and oleaginous foods contain but three elements, viz., carbon, hydrogen, and oxygen, the albuminous foods all contain a fourth element, nitrogen. This permits another classification and one which it is very important for us to remember. The organic foods are divided chemically into two classes (1) the nitrogenous including the albuminous food and (2) the non-nitrogenous, including the saccharine or the sweet foods, and the oleaginous or fat foods. Every particle of food, then, which we daily pass into our mouths,—bread, butter, meat, potato, pie or cake, all contain some elements that are nitrogenous and some that are non-nitrogenous.

THE USES OR FUNCTIONS OF THESE FOODS.

As alcohol is clearly of organic origin it will, for our present purpose, only be necessary to ask after the uses of the organic foods. These foods then are introduced into the body for three general purposes, viz., (1) to build up tissues and repair waste, (2) to produce heat, and (3) to produce energy. But since heat is only a form of energy we may combine the two uses last mentioned into one and condense our statement into this: food is anything which is needed in our bodies for the two general purposes,—tissue forming and energy producing. Take notice, however, "that to the above definition should be added this important condition that, neither the substance itself nor any of the products of its chemical transformation in the body shall be injurious to the structure or action of any organs, otherwise it would be a poison not a food."* In the light of these definitions let us examine alcohol. First, then,

CAN ALCOHOL BUILD UP TISSUES?

We answer that in the case especially of the more important tissues, nervous, muscular and glandular, alcohol cannot contribute to their growth. The reason is a chemical one but I trust this will not discourage you from fully appreciating it in all its force. The chemistry involved is very simple and can be grasped with ease by all. The briefest statement of the argument is, alcohol cannot build up muscular, nervous or glandular tissues, because it contains no nitrogen. These tissues are nourished mainly by the nitrogenous or albuminous food. Alcohol contains only carbon, hydrogen and oxygen,—its chemical formula being $C_2 H_5 O H$. What are these tissues? They are those which contribute the forces and activities to the body, the capability of motion either of the body as a whole or any of its parts. What is the secret of their forceful nature? The secret of their forceful nature is the nitrogen which they contain. Remembering that chemical action and chemical principles are the same everywhere we may borrow an illustration from inorganic chemistry to throw light on the statement just made. Gunpowder as you know is a mixture of charcoal, sulphur and potassium nitrate or saltpeter. In this mixture the charcoal and sulphur are used because of their easy combustibility, the saltpeter because it contains a large quantity of oxygen and also because the oxygen is in combination with nitrogen. This latter element is weak in its power to attach itself to other elements and when so combined its inertness renders it very willing to part company with them; that is to say, any compound containing nitrogen tends to be easily broken up. If now there is also present other elements which when first separated and then recombined produce large quantities of gaseous compounds and if these gases be confined so that they cannot freely escape, the result will be that great force or energy is developed. This in brief is the explanation of the force exerted by gunpowder. Now, muscle and nerve must possess some of the properties of this gunpowder, that is, in order that the process of disassimilation and assimilation shall go on rapidly they must be so constituted that they are easily and quickly decomposed and they must also be of such a nature as to yield a large amount of oxygen. The point I wish to emphasize and call particular attention to is that the initial movement for the whole series of phenomena is due to the nitrogen present; gunpowder, dynamite, nitro-glycerine contain nitrogen and hence their forceful nature. Muscle, nerve and gland contain nitrogen and hence their power to set into being those forces which give to the human body life and activity. I think we can now fully appreciate the weighty argument contained in the statement that alcohol contains no nitrogen and hence can not build up these tissues. We must go farther however before this argument is complete. Do not these tissues contain carbon, hydrogen and oxygen and may not alcohol contribute these while the nitrogen is drawn from some other source? Just here must be brought into view a fact in regard to the human body which is well known by physiologists and which compels us to answer the question in the negative. The fact here alluded to is

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*Martin's Human Body, Advanced Course, p. 298.

THE LIMITED CONSTRUCTIVE POWER OF THE HUMAN BODY.

Plants have marvelous constructive powers, they being able to take the elements as combined in minerals or uncombined as the case may be and work them over, thus reconstructing them into likeness with their own tissues. Not so in the animal world. Animals must have their food already prepared in that form which if not exactly like their own tissues is yet so near that it comes within the limit of their feeble powers to metamorphose them. The human body cannot, then, break up alcohol and recombine the elements into nerve or muscle or gland. In order that to the product of our own reasoning on this point and the conclusion we have come to, there may be added the weight of some high authority on the subject, I will quote again from Dr. Richardson the great English experimenter and investigator on this subject. He says, "Alcohol contains no nitrogen, it has none of the qualities of the structure-building foods; it is incapable of being transformed into any of them. It is therefore not a food in the sense of its being a constructive agent in the building up of the body." He adds this significant statement: "In respect to this view, there is, I believe, now no difference of opinion among those who have most carefully observed the action of alcohol." *

But it is said that "beer drinkers grow fleshy." Yes it is true that although alcohol cannot contribute to the growth of tissue it does have the baneful power of changing otherwise healthy tissue into an unnatural

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* Ten Lectures, p. 100.

fatty material and depositing it in places altogether abnormal and decidedly prejudicial to the welfare of the body. It changes the connective tissue of the heart, for example, into fat and hence results the well known disease

FATTY DEGENERATION OF THE HEART,

which finally produces death. I cannot now stop to discuss this phase of the subject but will dismissit with the well known scientific statement that fatty degeneration of tissues and the deposit of this fat in unnatural places frequently if not always accompanies the use of alcohol.

Besides, there is a converse side to this question which has already been incidentally brought out and that is that not only is alcohol not itself digested and assimilated but it coagulates the albuminous foods and in this way retards the digestion of these important food elements. In fact there is no disease more frequently brought to the attention of practicing physicians than is drunkard's dyspepsia. Indigestion is an almost universal accompaniment to the alcohol habit.

Still again let us try alcohol by some of the general tests for food and because I find them stated exactly as I want them in that splendid work on the subject, lately published, Gustafson's "Foundation of Death" p. 68. I quote his words:—

"1. The regular foods are essential to life. It is positively proved that alcohol is not essential either to life or health.

"2. The periodic need felt for regular foods ceases each time after being moderately supplied; even the momentarily importunate demand (caused by some special want), when satisfied, also ceases, or, if satiated or persistently denied, may even change to aversion.

"With alcohol, the desire, if steadfastly denied, will gradually cease, but if satiated, it begets abnormal craving, and the craving, having once taken hold, becomes the most insatiable of human passions. As Linnæus said, 'Man sinks gradually by this fell poison; first he favors it, then warms to it, then burns for it, then is consumed by it.'

"3. Regular foods, when taken in their proper ratio, are easy of digestion, and give the system a calm increase of vigor. Alcohol deranges digestion and disturbs the action of nerve-tissue."

This author adds, "To judge from these tests therefore, alcohol is not only not a regular food, but, if used as such, acts as a poison."

There still remains one important inquiry concerning the food value of alcohol.

IS ALCOHOL A HEAT OR ENERGY PRODUCER?

If we should make the appeal at this point to those who use alcohol in any amount the testimony would be almost universal that it was capable of producing heat which is felt at once and is unmistakable. We meet here one of the most deceptive phases anywhere to be noticed in connection with this subject. We have already seen how the capillaries are distended with an unusual amount of blood producing a congested and inflamed condition. This is especially true of the capilliaries of the skin. Here in these capillaries it is that evaporation is possible and here it is that the nerves of the temperature sense are located.

Two results follow from this condition:

1. An unusual amount of heat is required to carry on this evaporation, which heat is drawn from the interior of the body. The temperature of the body as a whole, therefore, is lowered instead of raised.

2. This heat thus escaping to the surface there comes in contact with the temperature sense nerves, and produces that glow of warmth which is so quickly manifest on the face and skin as soon as alcohol has been taken. It is an increase of heat only on the surface and that but for a short time and at the expense of internal heat. This is very significant when we remember that "the functions of life are greatly affected by even slight thermal changes, and only a few degrees below the normal will extinguish life; therefore anything which causes great fluctuations in bodily heat is dangerous to health and life."[*]

But, we must still inquire, may not the alcohol be oxidized in the interior of the body and thus be a source of heat? It is a familiar fact that the temperature of the body is maintained by the union of the oxygen with the tissues, these tissues serving as the fuel for the production of bodily heat. Alcohol, as is well known, is a highly combustible substance and may it not serve as the fuel? Just at this point the scientific world is divided, some maintaining that the alcohol is broken up and others that it passes through the body unchanged. We must examine both aspects of this question. That not all the alcohol introduced into the system is changed is proven by the well-known and characteristic alcoholic fumes escaping from the drunkard's body through the exhaled breath, his skin and by other channels. A certain amount of alcohol has been found in various parts of the body of persons who have died in an intoxicated state.

John Guthrie in his Temperance Physiology quotes the following from the statement of Dr. William Beaumont as to a post-mortem examination:—"I dissected a man who died in a state of intoxication after a debauch. The operation was performed a few hours after death. In two cavities of the brain, the lateral ventricles, was found the usual quantity of limpid liquid. When we smelled it the odor of whiskey was distinctly perceptible, and when we applied the candle to a portion of it in a spoon it actually burned blue. The lambent blue flame characteristic of the poison playing on the surface of the spoon for some seconds."[*] Of this alcohol thus passed unchanged into all parts of the system we say that even if it had no poisonous or evil effect on the various tissues and organs it still would be an evil as being so much foreign matter occupying the place which should be filled by nutrient matter and sound tissues, in this way acting as a clog or hindrance to the normal operations of the system. But we have seen that it is extremely poisonous to everything with which it comes in contact. Suppose we found that the bread or potato we were eating passed through the system unchanged, that the digestive juices were incapable of decomposing them, how long would it be before we should reject them from our dietary. Especially would we do this if we found that they were both indigestible and poisonous. If on the other hand we grant that much of the alcohol is oxidized, it can scarcely be said to mend matters very much. Looking simply at the necessity existing for maintaining the bodily temperature at a fixed point and finding that alcohol served as fuel to produce that temperature, one would be inclined to say that here at least we find this liquid performing a useful office for us. There is a fact, however, which lies behind this oxidation and heat production which must be considered. Oxidation takes place not alone that heat should be developed but also in order that by this process old tissues may be removed to make way for the assimilation of fresh food material, the health and activity of the body depending upon the processes of disassimilation and assimilation following each other in rapid succession. We live well only as we daily and momentarily die well. Tissues can only be quickly built up as they are quickly removed. Now the agent for this removal is oxygen; the process, oxidation or burning. We are now prepared to state the strong argument against claiming any food value for alcohol, viz., if oxygen is used to burn alcohol, some tissues which ought to be removed from the system will fail to be so removed for want of that oxygen.

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[*] Foundation of Death, p. 95.

[*] Foundation of death, p. 93.

The explanation of many conditions of the drunkard's body are now made clear to us; the bloated condition, the weak and flabby muscles, the blood-shot eyes, the discolored skin, the putrid breath, the sickening emanations from his entire body, all are indications of the awful condition of his entire system due to the withdrawal of the efficient and necessary oxygen from its legitimate work of removing waste and wornout tissue.

I have not considered that it was within my province to quote authorities to any extent; but rather to give reasons for the truths we desire to teach the children in our schools, but just at this point one or two such words will have great weight; Dr. Hooker, physician of the Arctic expedition under Sir John Ross, says: "When a continuance of exertion or endurance of cold is called for, alcohol does harm; for you are colder or more fatigued a quarter of an hour after taking it than you would have been without it."

Prof. Miller states that the Russian military authorities "interdict its use absolutely in the army, when troops are about to move under extreme cold; part of the duty of the corporals is to examine carefully the breath of each man on the morning parade, and to turn back from the march those who have indulged in spirits, it having been found that such men are peculiarly subject to be frost bitten and otherwise injured."

On his return home, Lieutenant A. W. Greeley, Commander of the Jeannette Arctic expedition, said that he intended as soon as his health was restored to give to the world the results of the experience of his party in the use of alcohol in the Arctic regions. The August, 1887, number of the Forum contains the promised article, "Alcohol in High Latitudes." Some very interesting facts are brought out about his own expedition as well as of others to the same regions and he sums up his conclusion as follows:

"It seems to me to follow from these Arctic experiences that the regular use of spirits, even in moderation, under conditions of great physical hardship, continued and exhausting labor, or exposure to severe cold, can not be too strongly deprecated."

On the other hand Henry M. Stanley testifies that the value of alcohol to fit one to endure the effects of a tropical climate is of a negative character, that it rather unfits one for a long march under those conditions.

It would seem that if alcohol is necessary to the human system at all it certainly ought to be in those extreme temperatures at the equator and the poles, which put so serious a strain upon the vitality of those unused to them. But Stanley's testimony to the folly of liquor drinking in the tropics is similar to Gen. Greeley's emphatic condemnation of it in the Arctic regions.

Just a moment for a brief recapitulation of the points of our indictment against alcohol:

1. It deranges and oftentimes destroys the blood corpuscles.
2. It coagulates the albumen and fibrin of the blood.
3. It paralyzes the organic nerves distributed to the blood capillaries and produces congestion and stagnation.
4. It destroys the natural functions of every organ in the body.
5. It gives rise to an almost innumerable train of evils and diseases peculiar to the alcoholic habit.
6. It can not build nervous or muscular or glandular tissue.
7. If it does produce heat and energy it thereby leaves unburned tissues in the system that ought to be removed.
8. It unfits the system to endure cold as its use in the end decreases the bodily temperature.
9. It equally unfits one to endure the heat of summer.
10. It is a poison.

PRACTICAL SUGGESTIONS RESPECTING THE VENTILATION OF BUILDINGS.

A REPORT TO THE STATE BOARD OF HEALTH. BY JOHN H. KELLOGG, M. D., MEMBER OF THE BOARD.

GENTLEMEN:—In obedience to your request, I herewith present in brief form a few suggestions and fundamental principles which it is believed may be found of service in arranging the ventilating system of public and private buildings. The sole effort has been to embody, in as brief and lucid a form as possible, the information which the writer has gathered during some years of study of the subject, and such facts as he has gleaned from his own experience in planning and superintending buildings of some size for hospitals and other purposes. The only recommendation offered for the plans and principles suggested is that they have borne the test of practical experiment in a satisfactory manner, which cannot be said respecting all the schemes for the warming and ventilation of buildings which have been offered in works on sanitary subjects published within the last score of years. In justice to himself, the writer ought to say that he has not undertaken to make this paper exhaustive, or anything more than what its title indicates; neither has he undertaken to enter the field which properly belongs to the architect, but rather to present simply such suggestions and theories as he has himself found of practical value, and which are susceptible of general application, omitting altogether the minor details, which, however necessary to the adaptation of a general plan or principles to any particular case, are likely to be of little service except in the special conditions to which they are specially adapted. Seeking, then, to avoid as much as possible redundancy of language and circumlocution in methods of presentation, let us begin at once the discussion of the things most essential in a correct scheme for the proper ventilation and heating of a building.

First of all, it may be stated that the ventilation and heating of a building must be considered together, for a successful working of each will depend upon the conditions of the other. It needs no argument to impress the fact that the amount of heat to be furnished in any given instance must depend very largely upon the amount of fresh air to be supplied per hour or minute. If the air of a room is to be changed four times per hour, certainly a proportionately larger quantity of fuel must be consumed than if the air is to be changed but once an hour.

The air supply of a room or building is generally determined by its size rather than by the number of persons by which it is to be occupied. This is certainly not a scientific method. A large room, occupied by but one or two persons might possibly admit through cracks, about windows and doors, and through its porous walls a sufficient air supply; while a small room, crowded with people, would require a very large provision for the supply of fresh air. The first thing, then, to be considered in the study of the ventilation of a room or building is the number of persons who are to occupy the space under consideration.

According to the most eminent sanitary authorities of England, each healthy adult person requires not less than three thousand cubic feet of air per hour. This statement is based upon careful experiments, which showed that if the normal quantity of carbon di-oxide contained in the atmosphere, which is two parts to every five-thousand parts of air, is increased to three parts in five thousand of air, the limit of tolerable impurity is reached; that is, if the amount of CO_2 is increased by respiration to a larger proportion than that stated, namely, three parts in five thousand, the air thus contaminated becomes productive of disease. It must not be supposed that the poisonous properties of such air are due to the chemical compound CO_2. Air may contain a much larger proportion of CO_2 provided this compound is derived from purely chemical sources, without injury being apparent. But when the CO_2 is furnished by the respiration of animals, there is associated with it a subtle poison, which has been shown by the eminent physiologist, Prof. Brown-Sequard, to be one of the most powerful poisons known, exceedingly minute quantities being sufficient to produce death.

A little computation based upon the experiments referred to will show that Dr. Parke's figures are certainly not extravagant. With each breath, each human being exhales into the air one cubic inch of carbon di-oxide, and a definite amount of organic poison associated with it. As air naturally contains two cubic inches of carbon di-oxide in every five thousand cubic inches of air, and as an additional cubic inch of CO_2, or three cubic inches in five thousand cubic inches of air is the limit of safety, it is evident that each breath renders unfit for further use, five thousand cubic inches, or approximately, three cubic feet of air. The average person breathes eighteen times per minute; consequently, each person spoils or renders unfit for further use, 3×18, or 54 cubic feet of air per minute. 54×60 gives us, as the amount of air which each person contaminates per hour, 3,240 cubic feet, a slight excess over the amount named by Prof. Parkes. Some other authorities place the line of dangerous contamination at a somewhat higher point, and consequently they require a smaller amount of air. Avoiding either extreme, we may place the amount of air required per hour for each healthy person, at about 2,400 cubic feet. It must be understood, however, that this rule applies to healthy persons only, and is not applicable to hospitals or buildings occupied by infirm or sick persons. For such institutions, and for manufacturing establishments in which the air may be contaminated by chemical or other processes, at least double the amount named, or 5,000 cubic feet of air per hour must be supplied. In any given case then, to ascertain the amount of air required per hour, we have only to multiply 2,400 or 5,000 as the case may be, by the number of persons to be supplied with air. The number of persons taken should be the maximum rather than the minimum number which the room or building is calculated to accommodate, for the evident reason that the capacity of a ventilating shaft, duct or opening, may be easily diminished, but cannot be so readily increased.

Having determined the amount of air required in any given case, the following important practical points remain to be determined:—

1. The circulation of the fresh air.
2. The area of fresh-air inlets.
3. The area of foul-air outlets.
4. The location of foul-air outlets.
5. The construction and location of foul-air ducts.
6. The location, sectional area and height of ventilating shafts.

7. The question of artificially assisting the draft by means of a pressure or suction fan, or by means of heat in the ventilating shaft.

We will consider each of these several questions in the order named.

1. A room cannot be properly ventilated without an efficient arrangement for the circulation of air. For this there must be for each space to be ventilated at least two openings: one for the admission of fresh air, the other for the removal of impure air. Nothing could be more absurd than the frequently witnessed attempt to ventilate a room by supplying it with a ventilating shaft connected with proper ducts and foul-air openings, but without any provision for a supply of fresh air. Such an arrangement is eminently well calculated to produce dangerous drafts through the opening of windows, and the impression that any attempt at efficient ventilation is liable to result in failure. It is also essential for the proper distribution of the air admitted to a room that the air shall be heated before it enters the room or building, or at the moment of entering.

2. To determine the required area of fresh air inlets, the amount of air required and the velocity at which the air is to travel must be known. Air heated to a temperature of 40° F. above that of the external air will travel at the rate of about five feet a second when entering a room of ordinary height, from which it may escape readily. If the escape of air from the room is assisted by means of an efficient ventilating shaft the velocity of the incoming air may be safely computed as ten feet per second. If the fresh air enters the room at a temperature so high as 120° F. to 150° F. the velocity of the air-current will be increased to 12 or 15 feet per second. Better practical results are obtained by large volumes of moderately heated air, traveling at a moderate speed, than from super-heated air traveling at a high velocity.

Calculating the velocity of the incoming air at ten feet per second it is only necessary to divide the total amount of air required per second by ten and the result will represent the area of free opening required. An allowance of at least forty per cent must be made when the openings are covered by register-plates. For example: Suppose the amount of air needed is 240,000 cubic feet per hour, sufficient to supply 100 persons with the minimum quantity of air. This requires 66⅔ cubic feet of air per second. Sixty-six and two-thirds divided by 10 is 6.6⅔. Adding 40 per cent for obstruction of register plate, gives us 9.3 square feet as the combined areas of the register-covered openings for admitting fresh air.

3. The number and location of the fresh-air inlets is not a matter of so great importance as is commonly supposed. If the fresh air enters the room at a temperature 20 to 40 degrees higher than that of the air of the room it will go at once to the ceiling no matter where or how admitted, and will thence gradually diffuse itself through the room, its course being chiefly determined by the location of the windows and of the foul-air-exit openings. I think it preferable that the fresh-air inlet should be in the wall, near the floor, rather than in the floor, as it is by this means better protected against the accumulation of dust and dirt.

In the case of large buildings containing several floors and many rooms or apartments to be supplied with air, it is best not to undertake to carry a separate fresh-air duct to each room, but to equalize the air pressure within the building by leading large ducts to the common hall or corridor of each floor, supplying each room of each floor through open transoms or register plates placed near the ceiling. This arrangement secures a constant supply of pure air in the halls or corridors from which each room can draw, and establishes a constant current in the direction of individual users of the air, the foul air being directly removed from each separate room by its own duct. This plan secures the greatest possible safety from the dissemination of contagion or the dispersal of any element capable of producing dangerous contamination of the air.

4. Experience has shown that in order to prevent unpleasant draft, the velocity of the air at outlet openings should not be greater than five feet per second. The necessary area of outlet openings is readily obtained then, by simply dividing the total amount of air to be supplied per second by 5. For example, suppose a room to be ventilated is calculated to accommodate thirty persons, each to be supplied with 2,400 cubit feet of air per hour. The aggregate amount of air to be supplied will be 30× 2400 or 72,000 cubic feet. Dividing this amount by 3600, the number of seconds in an hour, we have 20 cubic feet as the amount required for each second. Dividing this by 5, the velocity allowable, we have 4, which represents the necessary area for the foul-air outlets in square feet.

It must of course be understood that the figures thus obtained represent actual opening, and not an opening partially obstructed by a grate or register. As before stated forty per cent must be allowed for when the opening is covered by an ordinary register.

As regards the proportion of the area of the foul-air exits to the area of fresh-air inlets, it may be said that outlets should be at least double the area of the inlets, since a velocity of 10 or 15 feet per second may be allowed without injury or inconvenience at the inlet although such a velocity would not be tolerable at outlet openings.

5. When a room is heated wholly or chiefly by warm air, the distribution of heat in the room will be almost wholly controlled by the location of the foul-air outlets. The natural course of the air current is this: the heated air rises to the ceiling, spreads out, and coming in contact with the outer walls which are lower in temperature than the inside walls, especially the windows, it is cooled and falls to the floor. It is evident then that as the outer walls and the portions of the room adjacent to them are necessarily the coldest part of the room, the circulation of the air through the room and the proper distribution of the heat will be facilitated by placing the foul-air openings along the outer walls and preferably under the windows. If the foul-air outlets are placed in an inner wall or at the floor near an inside wall, one effect will be to draw toward this opening warm air which ought to have been utilized in warming the outer walls. Another effect, and one of the most disagreeable features attending this method of placing the foul-air outlets, is that the air which has been cooled by contact with the windows and outer walls and by its greater specific gravity has fallen to the floor, will be drawn the whole distance across the floor to the opening on the opposite side, thus constantly maintaining at the floor a stratum of cold air. An arrangement of this sort is a very frequent cause of cold floors, and consequently cold feet, and the resulting headaches from which the occupants of such a room are almost sure to suffer.

The foul-air outlets should be placed as near the floor as possible. The opening may be in the base board or in the floor itself. The only objection to the latter method is the collection of dust which is likely to be swept into the opening.

6. The ventilating ducts communicating with foul-air outlets should have a sectional area equal to the free area of the openings with which they communicate. This capacity should be maintained until the duct

reaches the ventilating shaft, and should be increased if several turns are made in the duct as each square turn has the effect to diminish the velocity of the air current nearly one-half. Square turns should never be made, and the ducts should be enlarged at the angles where a turn is necessary. In case a duct must be carried for some distance, its capacity should be increased fifty or even one hundred per cent to compensate for the great amount of friction occasioned by distance. The ventilating ducts should of course be made tight. For this purpose it is necessary that they should be lined with metal or some other durable material. Even well-seasoned lumber will shrink and open up large cracks, by which the efficiency of the duct will be very materially diminished. It is also a wise plan to construct ventilating ducts of some non-combustible material, or at least to line with such material as a caution against fire.

Only ducts coming from the same room or floor should be connected with a common ventilating shaft. Each story must have its own foul-air shaft; otherwise the counter drafts occasioned by the opening of doors and windows, especially in moderate weather, or the adverse influence of winds, will be certain to lead to contamination of the air of one room by the air of another room with which it is in communication through the common shaft.

It is of the utmost importance to supply each floor, and if possible each room, with its own independent ventilating shaft running as directly as possible to the open air without any connection with other ducts.

7. The location, sectional area, and height of the ventilating shaft, are questions of very great interest and practical importance. As regards location, it is always better that the ventilating shaft should when possible be located within the building, as in an inside wall; this insures a temperature equal to that within the building, and so secures a constant and positive draft, whenever the building is supplied with artificial heat. If, in addition, the vetilating shaft can be located adjacent to the chimney, or if the smoke can be carried up through it by means of a boiler iron stack or a stack constructed of sewer pipe, a still higher temperature of the air in the ventilating shaft and hence a better draft will be secured.

The sectional area of the shaft will depend upon the amount of air to be removed and the height of the shaft.

By a careful study of the tables of Parke and others, I have been able to construct a simple formula which is of great practical service in determining these two questions. The following is the formula: The square root of the height of a shaft, multiplied by the square root of the difference in temperature between the air in the shaft and the outside air, divided by four, equals the velocity of the air in the shaft in feet per second. In using this formula, it is of course necessary that two of the quantities should be known. The difference in temperature is a pretty constant factor. In fixing this the minimum difference should of course be chosen rather than the maximum, as a ventilating shaft which may have an ample capacity in extreme cold weather when the great difference between the external and internal air would secure a powerful draft, would be quite insuffcient to supply the necessary amount of air in moderate weather. I have chosen as a basis for obtaining the minimum difference in temperature, the tempertuare of 45° F. for external, and 70° F., the usual internal temperature. At a temperature much higher than 45 degrees, doors and windows are likely to be opened and hence the working of any ventilating apparatus would be interfered with. The difference between 45° and 70° is 25, which may be fairly taken as a basis for calculation.

The height of the ventilating shaft is usually determined by the architect, who considers it with reference to the architectural effect in the building. When this is given, we have but to take the square root of the known height of the chimney, multiplied by the square root of 25 which is 5, divide the product by 4 and you have as a result the velocity at which the air will travel in the shaft in feet per second. It only remains to divide the total number of cubic feet to be removed per second by the velocity of the air per second, and the result is the sectional area of the shaft which is sought. Let us take a simple example by way of illustration. Given the height of the shaft 50 feet, and the amount of air to be furnished 72,000 cubic feet per hour or 20 ft. per second, the formula would work out thus:

$\frac{\sqrt{50}\times\sqrt{25}}{4}$ = Vel. in ft. per sec. $=9$ ft. $\frac{20}{9}=2.22$ sq. ft., the necessary sectional area of the shaft.

If the area of the ventilating shaft is given, the height being left to be determined, it is only necessary to know the amount of air to be removed, the difference between the internal and external temperatures, and to fix upon the velocity at which the air shall travel. The sectional area of the shaft must often be determined by the conveniences of construction, being governed by the plan of the building. A very safe rule is to make the sectional area of the ventilating shaft equal to the combined sectional areas of all the ducts leading into it. It is possible to secure efficient ventilation with a ventilating shaft which is somewhat smaller than this, but this is unquestionably the safest rule to follow. To determine the rate at which the air will travel, it is only necessary to divide the amount of air in cubic feet required per second, by the sectional area of the shaft expressed in feet. With these data the determining of the required height is a very simple problem, using the formula which has already been given. An example will make this entirely clear.

Let us suppose that the conditions are as follows: air is required for 48 students. At 2,400 cubic feet per hour for each, the total amount needed would be 115,200 cubic feet per hour, or 32 cubic feet per second. The combined area of ducts of sufficient size to allow the transmission of this air at the rate of 5 feet per second would be $32\div5=6.4$ square feet, and the velocity will of course be 5 feet. The question we have to solve is what would be the necessary height of the ventilating shaft to secure this velocity, the difference in temperature being 25°F. The solution of this very practical problem is extremely simple. Bearing in mind the formula we will let H represent the height of the shaft, D the difference between the internal and external temperatures, and V the velocity of air per second; $\frac{\sqrt{H}\times\sqrt{D}}{4}=V$. Substituting the quantities which are known we have the following: $\frac{\sqrt{H}\times\sqrt{25}}{4}=5$. Reducing we have $5\sqrt{H}=20$; $\sqrt{H}=4$; $H=16$; that is, the height of the shaft required by the conditions named would be 16 feet. In most instances it is more convenient to employ a smaller shaft and one of greater height. Let us suppose such a case, in which the amount of air required per second is the same, namely, 32 cubic feet per second, and the sectional area of the shaft 4 square feet instead of 6. Dividing the amount of air required per second by the area of the shaft we have

8 as the velocity per second ($32 \div 4 = 8$.) Our formula then would be as follows: $\frac{\sqrt{H} \times \sqrt{25}}{4} = 8$ reducing we have $5\sqrt{H} = 32$; $\sqrt{H} = 6.4$; $H = 40.96$. In this case the height of the shaft would be practically 41 feet. By the same method the necessary height of shaft for any given area may be readily determined.

From an economical standpoint, other things being equal, it is far better to secure increased efficiency by increasing the size of the ventilating shaft rather than its height, for the obvious reason that the capacity of a shaft for removal of air increases directly with the increase in sectional area; whereas the velocity of the air current increases in direct ratio with the square roots of the heights of the shaft, thus requiring that the height of a shaft shall be quadrupled to double its efficiency, while it is only necessary to double its sectional area to secure double efficiency. There is also a loss by increase of friction and of cooling surface, and in the disproportionate increase of expense of construction. The cost of increasing the efficiency of a shaft one hundred per cent, by increasing the velocity of the air current, will be very much greater than in securing the same result by increasing its sectional area.

Cases occur, of course, in which the stronger draft secured by increased height of shaft is essential to the efficient working of a ventilating system, or the accomplishment of a specific purpose.

8. When possible to do so it is unquestionably preferable to so plan a system of heating and ventilation that it will operate efficiently by the aid of "natural draft" only. Such a system is as nearly automatic in its action as any ventilating system can be made. A draft which depends upon a mechanical apparatus, as a pressure or suction fan, or even upon a steam coil or other form of heating apparatus in the ventilating shaft, is very likely to be found defective when efficiency is most needed. I have visited many large institutions provided with large ventilating fans, and have never yet found one in which the apparatus was in constant operation. In many cases it had been inoperative for years and was not in running order. In one case I was informed that the fan was started "whenever the odors in the ward became so strong as to be very noticeable." To my nose the odors were at that moment very strongly pronounced, and yet the fan was not in operation. The noses of managers and attendants become accustomed to odors to the presence of which they are constantly exposed, so that they cease to be a proper means of testing the condition of the air.

Some years ago the writer visited a large hospital, the air supply of which, was wholly dependent upon a fan which was a pressure blower, and hence so constructed that when the fan was not in operation the opening for the entrance of air through the fan was very small. The fan was placed in the mouth of a tunnel nearly eight feet in diameter, just about the proper size for supplying air to the hospital at a moderate velocity, but the opening from the fan had a sectional area of only about four square feet. The hospital had been in operation for some three years. The fan had never been in operation since the opening day, as it was run by a separate engine and was so far from the building as to require the attention of a special engineer when in use, and consequently the air supply of the hospital, which was filled with sick people of all classes, was limited to the small opening described, there being no other. It is certainly unwise to so plan the ventilating system of a large building as to make the inmates absolutely dependent upon the efficient working of a mechanical apparatus of this sort. Mechanical and other means of assisting "natural draft" are, nevertheless, valuable and, in some instances, necessary accessories to a system of natural ventilation, especially for large buildings, as they furnish a means by which the disturbing influence of winds may be more or less completely overcome. The writer has had two large fans in use in buildings under his care for several years, as occasion has required. As usually constructed and employed, however, these appliances are almost useless from their inadequacy and inefficiency. This is especially the case when heat in the ventilating shaft is depended upon as the means of securing a strong draft, in consequence of the use of an amount of heating surface quite inadequate for the work required.

Ventilating shafts which are exposed on all sides, and even those which are placed in the outer walls of buildings, must be heated or furnished with a fan to insure a constant draft. The amount of heating surface usually provided in such cases is ridiculously small, and is not infrequently so placed as to be of very little value. When it is recalled that all the air supplied to a building must pass through the ventilating shaft it will be apparent that a considerable amount of heat must be imparted to this air to produce a strong draft in case the chimney is so situated that the air loses a considerable amount of its heat before it is expelled from the chimney.

From experiments which have been made (Box) for the purpose of determining the heating capacity of steam pipes we know that one square foot of surface of one-inch pipe (3 linear feet) will give off about 300 heat units per hour, or 5 heat units per minute under the conditions in which heating is required in a ventilating shaft. Five heat units will raise the temperature of 276 cubic feet of air 1° (1 cubic foot of air at 62° weighs .0761 lbs. The specific heat of air is .238. $5 \div .0761 \div .238 = 276$). Knowing the amount of air to be transmitted by the ventilating shaft per minute or second, it is easy to determine the amount of heating surface required to raise the temperature of the air one or more degrees. It is only necessary to divide the amount of air transmitted per minute by 276 to determine the number of square feet of heating surface required to raise the temperature of the given quantity of air 1° F.

Taking, for example, a case in which, as in our last illustration, the amount of air required to be transmitted is 32 cubic feet per second, or 1920 cubic feet of air per minute, we have $1920 \div 276 = 6.95$, practically 7 square feet of heating surface, or 21 linear feet of one-inch pipe, necessary to raise the temperature of the air 1° F. To raise the temperature of the air 5°, which would be quite sufficient to insure the successful working of the shaft, would of course require five times as much heating surface, or 105 linear feet of one-inch pipe.

The most economical method possible for heating a ventilating shaft is the combustion of fuel in the shaft itself. A number of years ago in studying the ventilation of the House of Parliament in London, by the aid of the assistant engineer who kindly conducted me through the subterranean region of this great structure, I was surprised to find that the current of air in the great towers, which are not merely architectural features but constitute the ventilating shafts of the building, was maintained by means of a great heap of burning coal which was placed exactly in the center of the shaft upon a high platform, the top of which was at about the same level as the top of the great horizontal ventilating ducts which entered the shaft at its bottom.

Fuel may be consumed in a shaft by means of a stove placed in a chimney, carrying the stovepipe up through it. In exceptional cases the smoke may be discharged directly into the shaft; but this arrangement is not always a safe one and hence cannot be recommended. The position of the heater is a matter of no small importance. I have sometimes seen a steam coil placed at the extreme bottom of the ventilating shaft, the first opening being several feet above it. In so placing the heater there is very little circulation of air, and hence its efficient heating capacity is not utilized. To secure the efficient working of a ventilating shaft the heater should be placed above the highest opening. It is, as a rule, not wise to have openings into a ventilating shaft at different levels, but if this arrangement cannot be avoided, the heater should certainly be placed above the highest opening; or if a long heater, placed against the side of the chimney, it should extend above the highest opening. Whether the heat should be concentrated near the lower portion of the shaft, or should be extended some distance along the inside wall, is a question which may be differently answered according to circumstances. There is an advantage in the extension of the heater some distance along the inner wall in that a better opportunity is afforded for radiation, and thus for heating the inner surface of the shaft, and so preventing the tendency to downward currents. It should be remembered, however, that the higher in the shaft the heater is placed the shorter will be the heated column, and hence, from this standpoint, the less the efficiency of the heat employed.

In conclusion, the writer wishes to disavow any attempt to make, in the foregoing, an extensive presentation of the subject of ventilation. Those who wish to make an extended study of the subject will find the means of doing so in the excellent work of Mr. Thomas Box, published by E. and F. N. Spon, 12 Cortlandt street, New York city. My aim in the preparation of this paper has been to present such practical points as I have gathered from a somewhat extended experience in planning the ventilation of large buildings in which I have had an opportunity to live for a series of years studying the result of various methods employed, and to formulate a few simple rules which are useful for the working out of correct methods of ventilation in all ordinary cases, and which are much less cumbersome for use than the ponderous formulæ of Box and others who have undertaken to present this subject in a scientific way. I ought also, perhaps, to call attention to the fact that, while the physical principles relating to heating, ventilating, etc., are correctly given by Box and other authors who have given much scientific data upon this subject, the suggestions made with reference to the supply of fresh air are, as a rule, widely at variance with the conclusions at which Parke, Angus Smith, and other investigators have arrived in the study of the question of ventilation from a sanitary and hygienic standpoint, and so are not to be relied upon. For example, Box puts the amount of fresh air required for each person per hour at 212 cubic feet, which is simply ridiculous, being less than one tenth the amount shown by ample experience to be really necessary.

RELATIONS OF CERTAIN METEOROLOGICAL CONDITIONS TO DISEASES OF THE LUNGS AND AIR-PASSAGES, IN COLORADO.*

BY HENRY B. BAKER, A. M., M. D., LANSING, MICHIGAN.

It is probably known to most of the members of this association that in preceding papers, before this association and elsewhere, I have presented extensive statistics of sickness and of mortality which proved conclusively, to my mind, that certain meteorological conditions are related closely and causally to all the important ordinary diseases of the lungs and air-passages, in certain parts of the world, that is, in Michigan, in Massachusetts, in London England, in India, etc. The evidence is of such a character as to lead me to think that similar causal relations prevail throughout the world. But this has not yet been demonstrated. The purpose of this paper is to extend the evidence on this subject by the presentation of facts bearing upon it, collected here in Colorado, and in a few other parts of the world, where the subject has not heretofore been studied in a scientific manner, or, at least, not conclusively.

It may seem presumptuous for me to attempt to do this for Colorado, when there are so many able physicians in Colorado who are especially interested in climatology and in diseases of the lungs and air-passages; but, after having waited some years for some one of these able men to collect and publish such facts, my interest and curiosity to know the facts have overcome my modesty, and I have recently made a vigorous effort to obtain and group the facts for study. A large number of physicians, health officers, and officers in charge of public institutions in Colorado were written to, blank forms were sent to them, and an effort was made to obtain, from them, and from published records, statements of the month of death of all decedents in Colorado, from consumption and other diseases of the lungs and air-passages. I have to thank D. C. Dudley, writing for John E. Ray, Supt. of the Colorado School for the Deaf and the Blind, and Joseph A. Lamping, warden of Colorado State Penitentiary, for prompt responses to my requests; also Charles Ambrook, M. D., of Boulder, and T. G. Horn, M. D., of Colorado Springs, for valuable statistics of deaths in Colorado. I am indebted to the Health Commissioner of Denver for a statement of the deaths from consumption during each month of the year 1889; also to the U. S. Census of 1870 for a statement of the deaths from consumption in Colorado during each month of the census year 1870. I regret that the U. S. Census for 1880 does not state such facts relative to Colorado, or any city in Colorado. I am indebted to Sergt. Gilligan, of the U. S. Signal Service, now stationed in Denver, for data relative to wind and rainfall.

The statistics of deaths in Colorado from diseases of the lungs and air-passages other than consumption are so meagre that I have not been able to learn much from them. The statistics of deaths from consumption which I have collected and now present to you are not as numerous as wished, but they are valuable and quite worthy of study. It is to be hoped, however, that the public-spirited physicians in Colorado will see to it that such important facts as those relating to vital statistics in Colorado will not be so much neglected as they have been heretofore. People all over the world look to Colorado for such facts. It is gratifying to note that the city of Denver now publishes a monthly statement of the causes of deaths in Denver.

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* Read before the American Climatological Association, at its meeting in Denver, Colorado, in September, 1890.

In order best to study the statistics of consumption in Colorado, and the relations of consumption to atmospheric conditions, I have put the evidence in tables, and in graphic diagrams accurately drawn to scale and correctly representing the facts in the tables.

CONSUMPTION AND TEMPERATURE IN COLORADO.

TABLE 1.—*Exhibiting by months (each made 30 days) for the years 1870 and 1875–89, the Average Number of Deaths from Consumption* in Colorado, also the Average Atmospheric Temperature† for the 16 years, 1872–87, in Denver, Colorado.*

Years and months.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average number of Deaths from Consumption* in Colorado by months, (each made 30 days) 1870 and 1875–89	44.52	41.33	35.81	41.00	40.65	29.00	25.16	32.90	31.00	39.68	42.00	41.61
Average number of Deaths from Consumption in Colorado,* (months unequal) 1870 and 1875–89	46	39	37	41	43	29	26	34	31	41	42	43
Average number of Deaths from Consumption in Colorado Springs, 1875–89, (months unequal)	10	4	7	6	10	8	3	4	10	6	6	4
Average number of Deaths from Consumption in Boulder, 1881-89, (months unequal)	4	3	3	1	3	2	2	4	3	1	0	3
Number of Deaths from Consumption in Denver, 1889, (months unequal)	28	31	20	32	28	14	18	25	17	34	34	31
Number of Deaths from Consumption in Colorado, in 1870, U. S. Census, 1870, (months unequal)	4	1	7	2	1	5	3	1	1	2	2	5
Average Atmospheric Temperature in Colorado, 16 years, 1872–89	27.3	32.2	37.9	46.5	57.2	67.2	72.4	70.4	61.3	50.1	37.6	30.5

* Deaths from consumption in Colorado during the census year 1870, in Denver during 1889, in Colorado Springs and in Boulder for a long series of years.

† From Report of the Chief Signal Officer, U. S.

NOTE.—The first and seventh lines in Table 1, are graphically represented in Diagram 1.

CONSUMPTION AND ABSOLUTE HUMIDITY IN COLORADO.

TABLE 2.—*Exhibiting by Months (each made 30 days), for a series of years, the Average number of Deaths* from Consumption in Colorado, also the Average Absolute Humidity† (Grains of Vapor in a cubic foot of Air) for a series of years in Denver, Colorado.*

Months.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths from Consumption*	**44.52**	**41.33**	**35.81**	**41.00**	**40.65**	**29.00**	**25.16**	**32.90**	**31.00**	**39.68**	**42.00**	**41.61**
Av. Absolute Humidity†....	**0.96**	**1.17**	**1.43**	**1.81**	**2.55**	**3.41**	**4.09**	**4.08**	**2.77**	**1.96**	**1.41**	**1.12**

* Deaths from Consumption in Colorado during the census year 1870, in Denver during 1889, in Colorado Springs and in Boulder for a long series of years.

† Computed from Average Temperature and Average Relative Humidity by Table X., page B. 93, "Smithsonian Meteorological and Physical Tables," 1859.

NOTE.—Table 2 is graphically represented in Diagram 2.

CONSUMPTION AND RELATIVE HUMIDITY IN COLORADO.

TABLE 3.—*Exhibiting by Months (each made 30 days), for a series of years, the Average number of Deaths from Consumption* in Colorado, also the Average Relative Humidity‡ of the Atmosphere (Per Cent of Saturation) at Denver, Colorado.*

Months.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths from Consumption*	**44.52**	**41.33**	**35.81**	**41.00**	**40.65**	**29.00**	**25.16**	**32.90**	**31.00**	**39.68**	**42.00**	**41.61**
Av. Relative Humidity‡	**55.0**	**54.9**	**49.9**	**50.1**	**49.1**	**47.4**	**48.4**	**50.7**	**46.5**	**48.3**	**53.1**	**56.3**

‡ From Reports of the Chief Signal Officer, U. S.

NOTE.—Table 3 is graphically represented in Diagram 3.

CONSUMPTION AND TEMPERATURE IN 31 CITIES IN THE UNITED STATES.

TABLE 4.—*Exhibiting by months (all made 30 days) the number of Deaths* from Consumption in 31 Cities in the United States during the census year 1880, also the Average Atmospheric Temperature† at six Stations.*

Months.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Deaths from Consumption*..................	1,691.61	1,846.58	1,897.74	1,821.	1,657.74	1,420.	1,486.43	1,382.90	1,529.	1,587.10	1,595.	1,683.87
Average Atmospheric Temperature†........	36	38	45	54	66	74	78	76	69	56	46	38

* From data in Vol. XII, Part II, page lxi, Tenth Census Report, U. S., 1880.
† From normals at six Stations: Cincinnati, St. Louis, Memphis, Nashville, Fortress Monroe and Philadelphia.
NOTE.—Table 4 is graphically represented in Diagram 4.

CONSUMPTION AND AVERAGE VELOCITY OF THE WIND IN COLORADO.

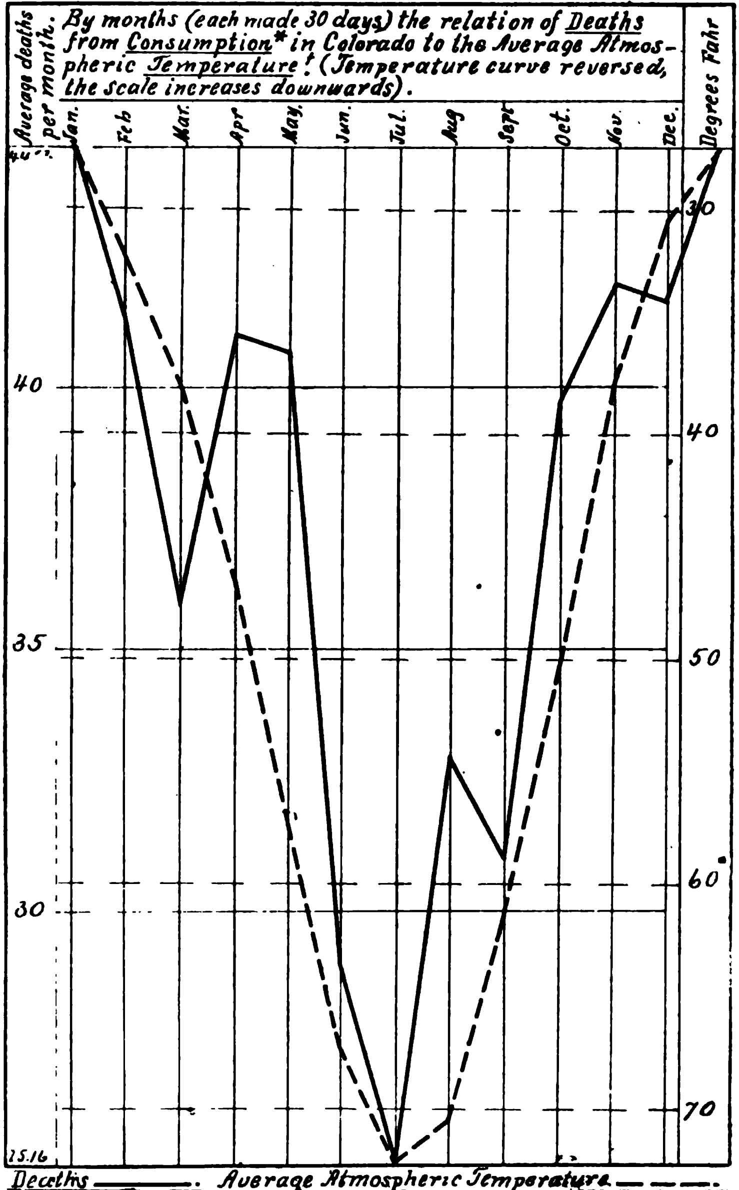
TABLE 5.—*Exhibiting by months the average daily velocity of the Wind* for a period of 16 years, 1872–87, at Denver, Colorado; also the monthly average rainfall* for the same period of time at the same place.*

Months.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Daily average velocity of the wind, 16 years, 1872–87, at Denver, Colorado*.....	165.8	160.9	178.0	180.2	165.5	159.4	150.6	139.2	138.1	147.1	154.1	151.6
Average monthly rainfall, for 16 years, 1872–87, at Denver, Colorado*............	0.639	0.487	0.926	2.108	2.784	1.508	1.728	1.666	0.926	0.731	0.784	0.721
Deaths from Consumption†..............	44.52	41.33	35.81	41.	40.65	20.	25.16	32.90	31.	39.68	42.	41.61

* The data for velocity of the wind and rainfall were supplied by Sergeant J. J. Gilligan, United States Signal Service, Denver, Colorado.
† In Colorado during the census year 1870, in Denver during 1889, in Colorado Springs and in Boulder for a long series of years. The months are here made of equal length—30 days.

The lines "Daily average velocity of the wind" and "Deaths from consumption" in Table 5 are graphically represented in Diagram 5, page cxxxv.

No. 1.— Consumption, and Temperature in Colorado.



By months (each made 30 days) the relation of Deaths from Consumption* in Colorado to the Average Atmospheric Temperature.† (Temperature curve reversed, the scale increases downwards).

Deaths ————. Average Atmospheric Temperature — — —.

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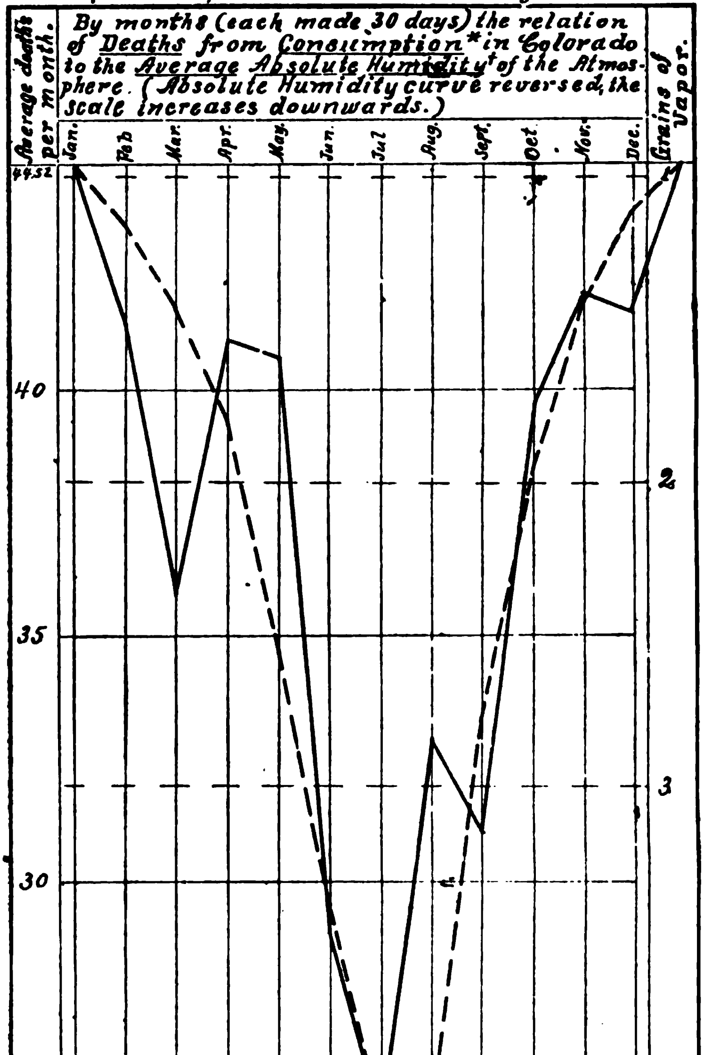
*The Temperature curve represents the Average for a period of 16 years, 1872-87. The data are from the Reports of the Chief Signal Officer, U.S

†The curve for Deaths from consumption represents the deaths occurring in Colorado during the census year 1870, in Denver during 1889 in Colorado Springs and in Boulder during a long series of years.

No. 2.—Consumption and Absolute Humidity in Colorado.



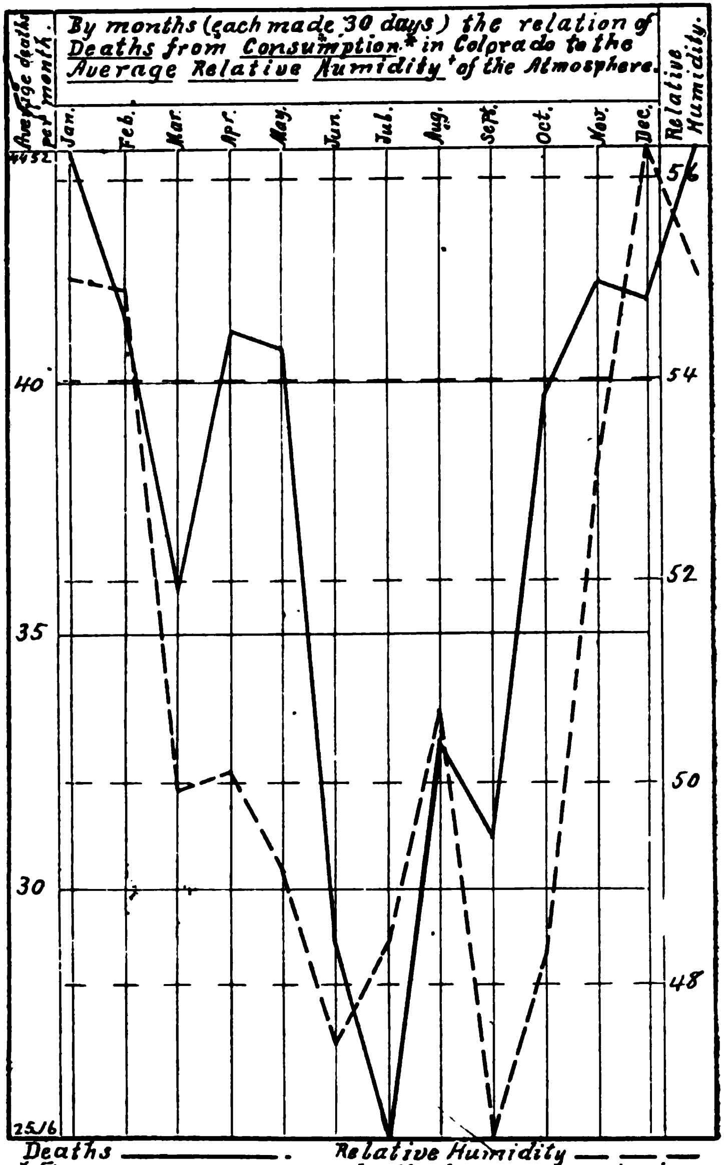
By months (each made 30 days) the relation of Deaths from Consumption* in Colorado to the Average Absolute Humidity† of the Atmosphere. (Absolute Humidity curve reversed, the scale increases downwards.)

Deaths ————, Average Absolute Humidity — — —.

*The curve represents the deaths from consumption in Colorado during the census year 1880, in Denver during 1889, in Colorado Springs and in Boulder during a long series of years

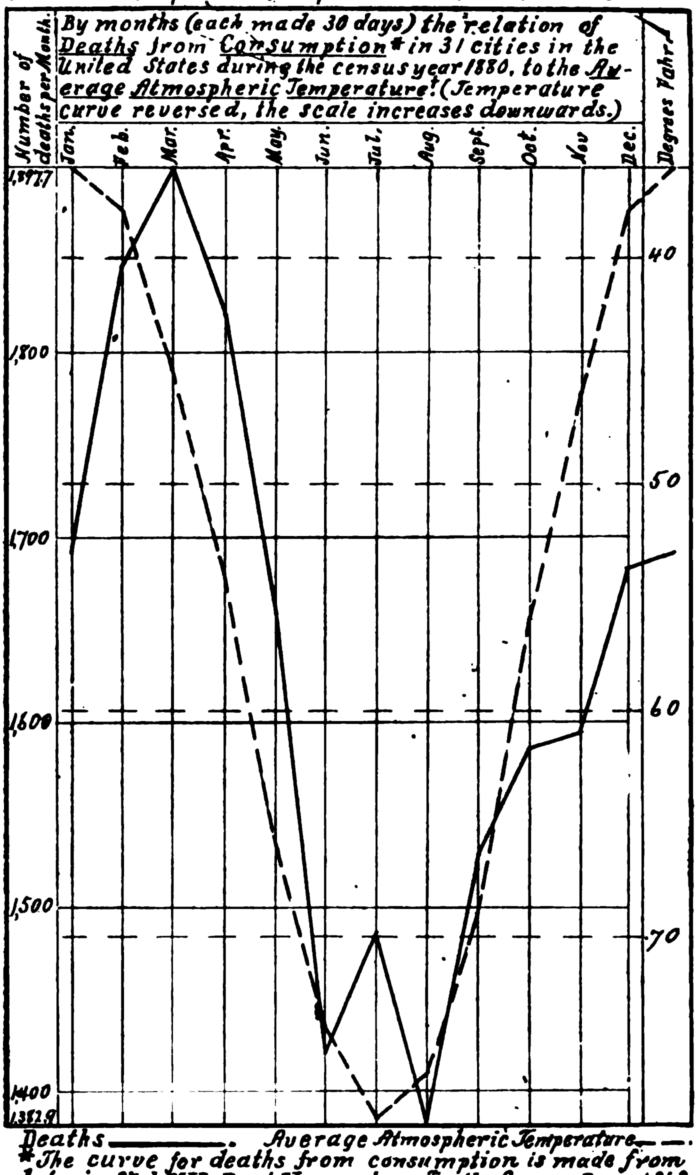
†The absolute humidity was computed from monthly averages of temperature and relative humidity in Denver, Colorado, by Table X. Page B 93, "Smithsonian Meteorological and Physical Tables, 1859.

No. 3.—Consumption and Relative Humidity in Colorado.



*The curve represents the deaths from consumption in Colorado during the census year 1880, in Denver during 1889, in Colorado Springs and in Boulder during a long series of years. †The curve for relative humidity represents the average for a period of 10 years, 1878-87. The data is from the Reports of the Chief Signal Officer, U.S.

No. 4.—Consumption and Temperature in 31 Cities in the U. S.



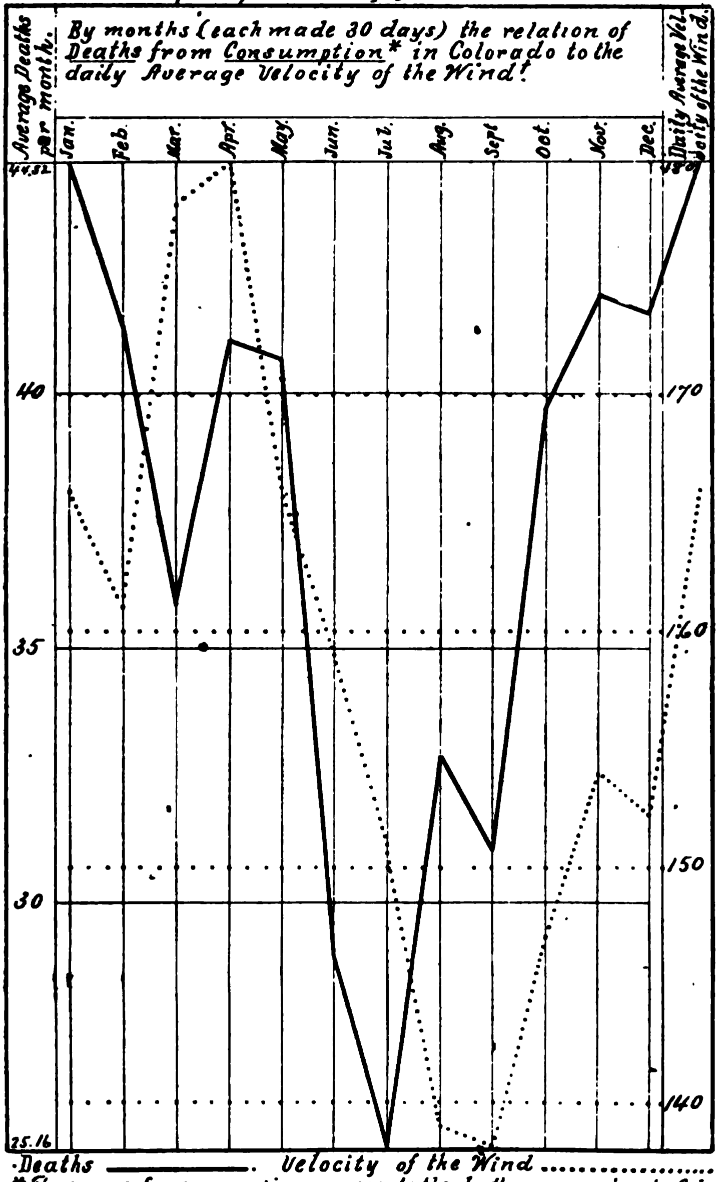
By months (each made 30 days) the relation of Deaths from Consumption* in 31 cities in the United States during the census year 1880, to the Average Atmospheric Temperature.† (Temperature curve reversed, the scale increases downwards.)

Deaths ———. Average Atmospheric Temperature — —.

* The curve for deaths from consumption is made from data in Vol. XII., Part II. page lxi, Tenth Census Report, U.S., 1880.

† The temperature curve is made from the normals at six stations: Cincinnati, St. Louis, Memphis, Nashville, Fortress Monroe, and Philadelphia.

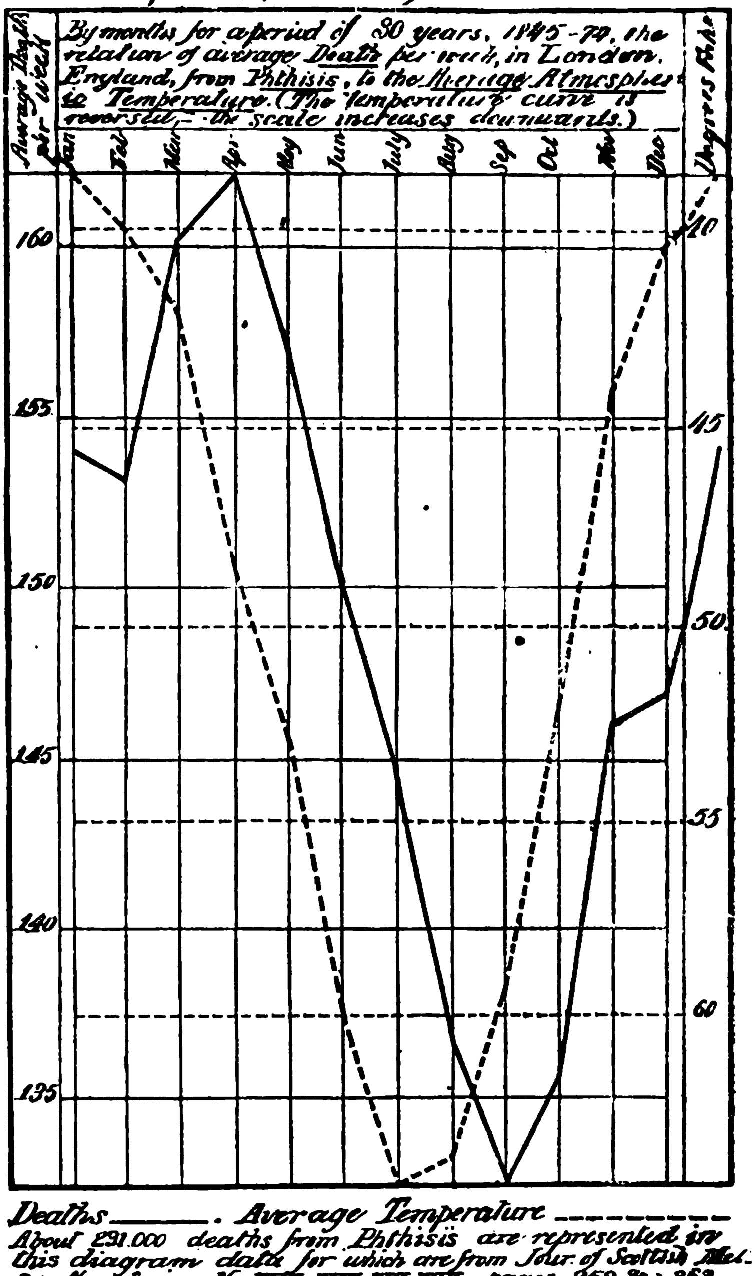
No. 5.— Consumption, and Velocity of the Wind in Colorado.



*The curve for consumption represents the deaths occurring in Colorado during the census year 1870, in Denver during 1889, in Colorado Springs and in Boulder for a long series of years.

†The curve for velocity of the wind represents the daily average for 16 years, 1872-87, at Denver, Colorado. The data was supplied by Sergt. J. J. Gilligan, U.S. Signal Service Denver, Colorado.

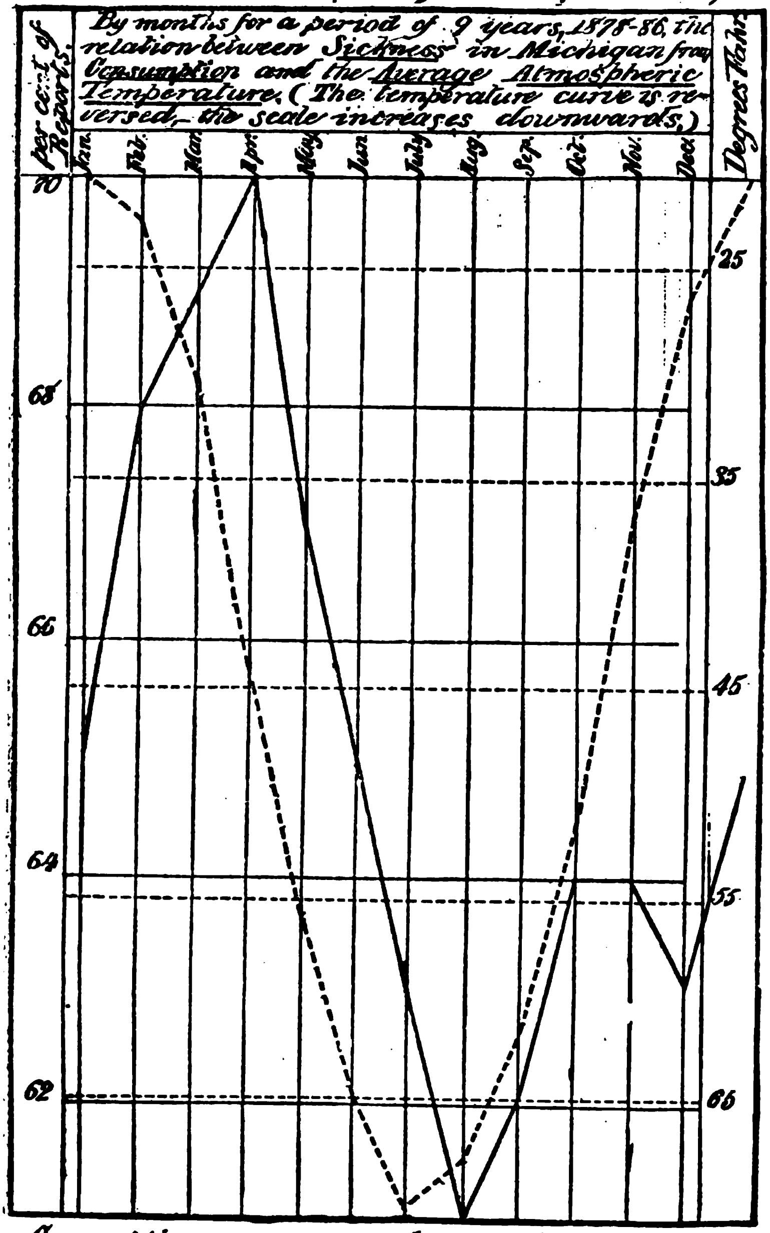
No 6.—Temperature, and Deaths from Phthisis in London.



Deaths ———. Average Temperature - - - - - - -

About 231.000 deaths from Phthisis are represented in this diagram data for which are from Jour. of Scottish Met. Soc., New Series Nos XXIII, XXIV, XXV, XXVI, pages 262 and 263.

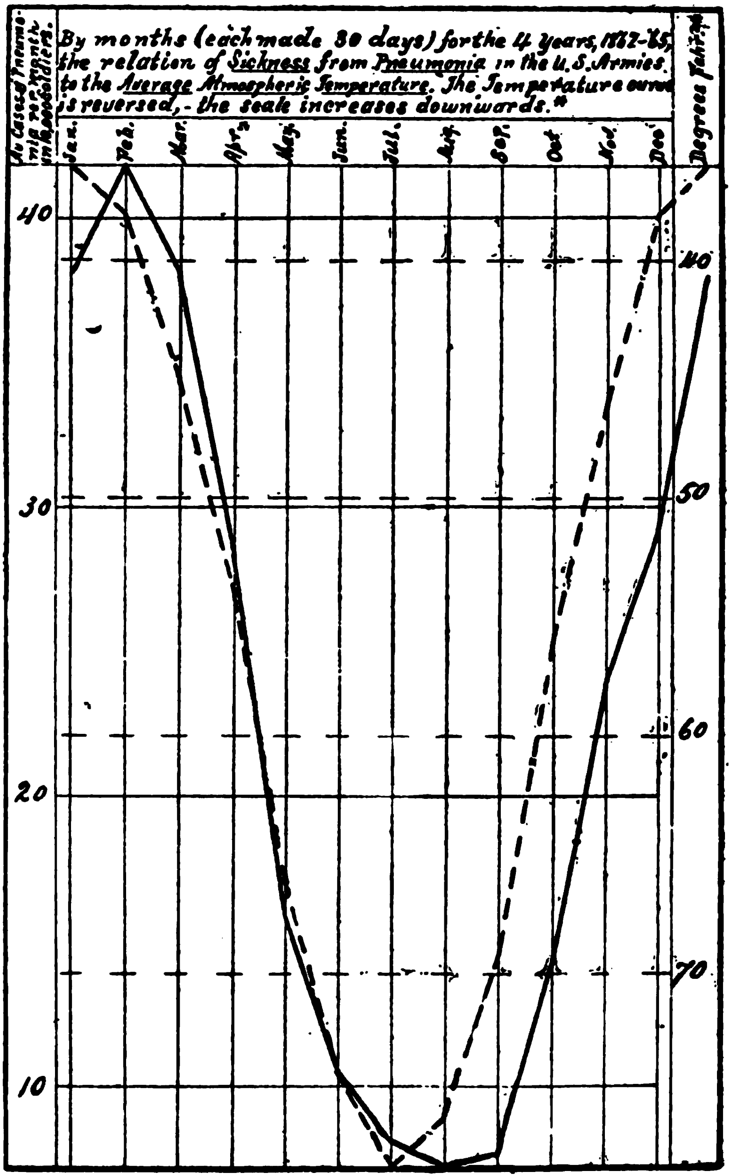
No. 7 Temperature and Sickness from Consumption in Michigan.



By months for a period of 9 years, 1878-86, the relation between Sickness in Michigan from Consumption and the Average Atmospheric Temperature. (The temperature curve is reversed,—the scale increases downwards.)

Consumption ——— Average Temperature - - -

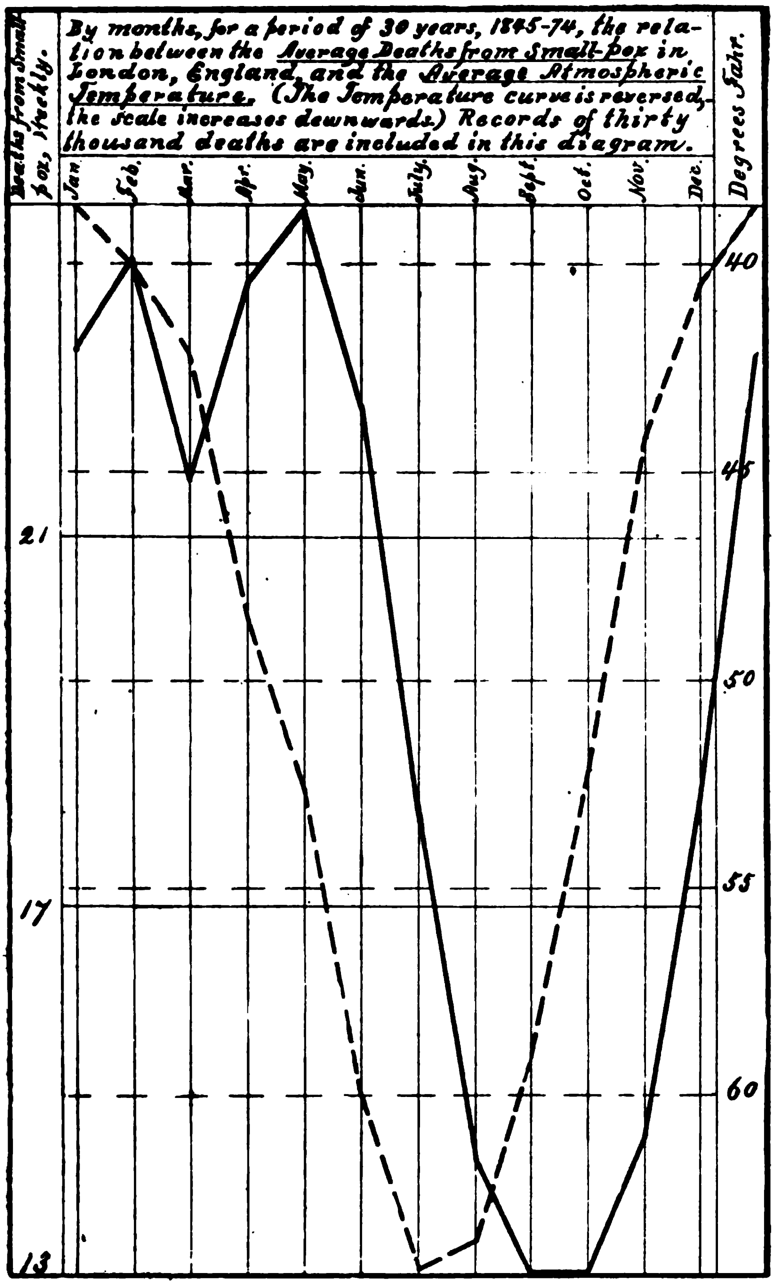
Diagram 8.—Temperature and Sickness from Pneumonia in U.S. Armies.



Pneumonia ————, Average Temperature — — —

*The temperature curve is made from the normals at six stations representing approximately the localities occupied by the armies of the United States, during the war of the rebellion.

No. 9.—*Temperature, and Deaths from Small-pox in London.*

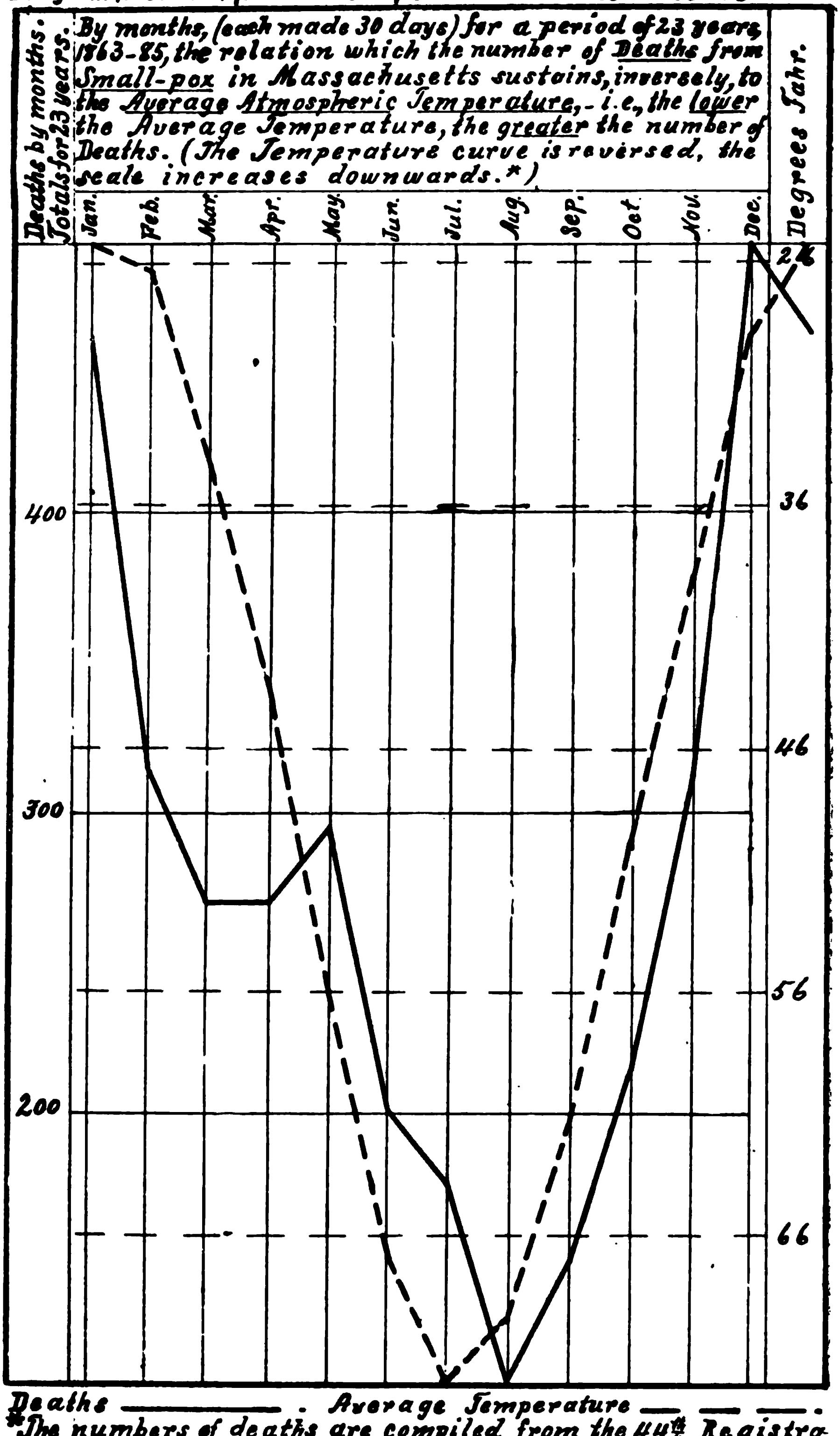


By months, for a period of 30 years, 1845-74, the relation between the Average Deaths from Small-pox in London, England, and the Average Atmospheric Temperature. (The Temperature curve is reversed, the scale increases downwards.) Records of thirty thousand deaths are included in this diagram.

Small-pox ———. Average Temperature — — —.
Except in a few months the Small-pox follows two months later than the temperature changes.

The line representing Small-pox should follow as long a time later than a line representing its controlling condition as is the average duration of the fatal cases plus the period of incubation?

Diagram 4.—Small-pox and Temperature in Massachusetts.



By months, (each made 30 days) for a period of 23 years, 1863-85, the relation which the number of Deaths from Small-pox in Massachusetts sustains, inversely, to the Average Atmospheric Temperature,- i.e., the lower the Average Temperature, the greater the number of Deaths. (The Temperature curve is reversed, the scale increases downwards.*)

*The numbers of deaths are compiled from the 44th Registration Report of Mass., 1886. The Average Temperature is compiled from a table on page 40 of the Smithsonian Tables "Distribution and Variations of the Atmospheric Temperature." It is for a period of 48 years between 1790-1870, at Cambridge, Mass.

Tables 1, 2 and 3, and Diagrams 1, 2 and 3 exhibit the deaths from consumption in Colorado by months; and, by months, the relation which the consumption mortality sustains to the atmospheric temperature, the absolute humidity, and the relative humidity.

It requires only a glance at Diagram No. 1 to prove that in Colorado, as in all other parts of the world thus far studied, the mortality from consumption is much influenced, directly or indirectly, by the temperature of the atmosphere. There is such a general correspondence of the two curves (for consumption and atmospheric temperature) as to indicate some necessary relation between them. In fact the mortality follows the temperature curve with less interval of time than is found to be the case in Michigan, in Massachusetts, in London, or in the U. S. army. So far as relates to Michigan and London, this is shown by studying Diagram 1 in comparison with Diagrams 6 and 7 submitted herewith. This seems to prove that in Colorado the deaths from consumption follow the fall in the temperature at least a month sooner than they do in any other part of the world which I have studied. We may well study further concerning this fact, in order to learn, if possible, the reason why this is so:

It will be seen by Diagram No. 1, relative to consumption in Colorado, that there are least deaths in the warmest month and most deaths in the coldest month, while in all the diagrams except those for Colorado, the curve for consumption, whether it represents sickness or deaths, follows *after* the curve representing the atmospheric temperature, there being usually one or two months between the temperature changes and the corresponding changes in the consumption. The same is usually true concerning small-pox, although in Diagram No. 4 relative to small-pox in Massachusetts, of the printed series submitted herewith, page cxl, there are exceptions to the rule that the time is about two months. As regards small-pox (contracted because of the sore throat due to exposure to cold) it seems that to a person exposed to the inhalation of cold air it is usually a month or more before the small-pox proves fatal. The period of incubation being about half a month, the remaining half month or more represents the length of the fatal illness, and the time which elapsed between the exposure to the cold air and the contraction of the disease.[*] I have found that the changes in the *sickness* from consumption in Michigan and in the U. S. Armies, follow about the same length of time later than the temperature changes, as do the changes in the deaths from small-pox; that is, one or two months later. I think the explanation probably is that consumption of the lungs is most frequently contracted in the same way that small-pox is—that is, by the specific cause being inhaled. Also that to persons having tubercular infection in some other part of the body, consumption of the lungs may occur through exudations brought about by exposure to the inhalation of cold air. If these are the true explanations, then not only should the *sickness* from consumption follow the exposure, as it does, after about the same interval of time as does the small-pox sickness, but a portion of the *deaths* from consumption of the lungs should follow, as is the case, after about the same interval, because the exudations and the consumptive processes are increased by exposure to cold air. That all the inflammatory and exudative diseases of the throat and air-passages are increased by exposure to cold atmosphere, in Michigan and in every country in which the subject has been systematically studied, there can be no question. That the average deaths from consumption follow more quickly after the atmospheric changes in Colorado than they do in the other States and countries may, I think, be due to the assumed fact (I suppose it to be a fact) that the consumptive inhabitants of Colorado are, as a rule, nearer death than are the consumptive inhabitants in the other States and countries studied, that being the reason why they left the Northern and Eastern States to seek restoration to health in this favored region.

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[*] In London, England. the changes in the deaths from small-pox follow at least two months later than the changes in the atmospheric temperature. There are nearly twice as many deaths from small-pox following the cold weather as there are folowing the warm weather. This is shown by Diagram No. 9, page cxxxix.

There is, however, another item of evidence in the same direction: the difference between the mortality during the warmest month and that during the coldest month is greater in Colorado than in Michigan, Massachusetts, or London England. It is even greater than it was in the U. S. Armies during the war of 1861–5, where the mortality in March was 62 per cent greater than it was in September, while in Colorado the mortality in January is about 77 per cent greater than it is in July. Taking the statistics as they are, it thus appears that not only do consumptives die *more quickly* on exposure to cold in Colorado than in other States and countries, but a much *larger proportion of them die* on exposure to cold, or if not that then Colorado is proportionately more favorable to consumptives in summer.

However, although I have been told by a few physicians and other residents who claimed to know, that consumptives come to Colorado at all seasons of the year in about equal proportions, yet from the best evidence I can obtain I am inclined to think that a few more come in winter than in summer, and that more leave Colorado in summer than in winter, and that a part of the greater number of deaths from consumption in Colorado during the winter is due to those movements of consumptives.

And the reverse of the foregoing is undoubtedly true of Michigan, of Massachusetts, and of London England, as is distinctly indicated for the first and last-named places, I think, by the Diagrams Nos. 6 and 7 in which it may be seen that the curve representing the sickness (or the deaths) from consumption is so low from November to February as to be unaccountable by almost any supposition except that many consumptives left those parts of the world during the cold months. I think that, as a rule, they go to warmer climates, but I believe that some of them go to Colorado.

With the view of learning more, if possible, about these movements of consumptives, and the influence they have on the mortality and morbility statistics, I have studied the combined statistics of deaths from consumption in Northern and Southern cities, by means of a graphic diagram made from data in the U. S. census of 1880. This diagram is No. 4 of the series made to illustrate this paper. From that diagram it may be seen, however, that there are still such depressions in the curve representing the winter months as to indicate that not so many consumptives are present in those cities, on the average, in the winter months as in the summer months. The reason for this is, perhaps, because the list includes more large cities in the Northern than in the Southern States.*

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* I regret that I cannot now give a curve representing Los Angeles, California, or the State of Florida, where consumptives go for the winter months.

Consumption, and Humidity of the Atmosphere.

By reference to Diagram No. 2, it may be seen that the relation of consumption to absolute humidity in Colorado is quite close, as it has been found to be wherever the subject has been studied, the *most* mortality from consumption occurring in Colorado when there is the *least* vapor of water in the atmosphere, and the *least* mortality when there is *most* vapor of water in the atmosphere. The relation thus being inverse, the curve, in Diagram No. 2, representing the absolute humidity, is reversed in order to facilitate the comparison. The comparison shows that there is a quantitative relation between absolute humidity of the atmosphere and mortality from consumption in Colorado.

Diagram No. 2 also exhibits the fact that there are a few very noticeable exceptions to the general rule of quantitative relation between absolute humidity and consumption in Colorado. And it is a fact, worthy of especial study, that the most of these exceptions seem to find explanation in Diagram No. 3, exhibiting the *relative* humidity and its relations to the mortality from consumption. Diagram No. 3 exhibits the fact that in Colorado there is, what I have not found to be true in any other State or country, a well-marked relation between the relative humidity and the mortality from consumption, there being noticeably *more* mortality in months when the atmosphere was *more* than usually saturated with vapor of water, and *less* mortality in months when the atmosphere was *less* than usually saturated. In Diagram No. 3, therefore, neither of the curves is reversed.

A comparison of Diagrams 1, 2, and 3 shows that in Colorado the relation of consumption to relative humidity is not so close and quantitative as is the relation of consumption to atmospheric temperature and to absolute humidity, yet it shows that nearly all the departures from quantitative relations of temperature to consumption are in just those months when they are accounted for by the changes in the relative humidity, that is, if we accept the prevalent belief in the unfavorable influence of great *relative* humidity. The evidence in these several diagrams 1, 2, and 3, is in complete harmony with what I wrote on this subject some years ago when studying the subject for Michigan, and which I cannot now state in much clearer language: "Theoretically, it would appear that great relative humidity may be directly injurious to human tissues in cold weather by reason of the increased abstraction of heat from the body and particularly from the air passages, because of the much greater specific heat of water than of air,—the body parting with its heat by conduction so much more rapidly to moist than to relatively dry air. The circulation of the blood through the lungs may be interfered with by such abnormal abstraction of heat while exposed to out-door air, and by the reaction consequent upon a return from such cold 'moist' atmosphere to a heated room. Congestion of the lungs may perhaps be thus induced."*

For ages there has been a widespread belief that exposure to cold air that was moist, relatively, was injurious to persons liable to lung disease. Theoretically it was injurious, as I have just stated. We now have, in these tables and diagrams, evidence which is, to a certain extent, exact and quantitative, and is therefore available for study in a scientific manner.

It seems that, in Colorado at least, relative humidity does modify the controlling influence which the fall and rise of atmospheric temperature has over the rise and fall of mortality from consumption, a fall of about five per cent in the relative humidity, when the atmospheric temperature is about 60° F., causing a decrease in the mortality of (about five thirty-sixths)—about one-seventh. Approximately this seems to be indicated by a study of the curves in Diagrams 1 and 3 for the month of September, estimating what the mortality might have been in September if midway between what it was for August and October. Again, the diagrams show that in March a fall of relative humidity, of about three per cent, is associated with a fall in the death-rate from consumption equal to about (five fortieths) one-eighth of the whole.

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*Causation of Pneumonia, Report Mich., Board of Health, 1886, page 284.

Of course I am speaking only from the evidence which I have been able to collect. I regret that the statistics of mortality in Colorado are so meagre. And it is especially to be regretted that we have not for Colorado as we have for Michigan statistics of the *sickness* from all the important diseases. What information is of more value than that which relates to life and death,—that which should enable us to know just what conditions tend toward continued normal life, and what conditions tend toward death "as the fool dieth?" For, truly, now as in Bible times our "people are destroyed for lack of knowledge."*

Clinical Experience.

In this connection, however, I wish to try to correct one prevalent error. We have some knowledge which is positive and useful, and when discredit is attached to it progress is retarded. It is a common thing to discredit statistics. People seem to forget that statistics consist of numerous facts, and that the greater the number of facts of a kind that are brought together the greater is the probability of the truth of the average statement of them, because errors of statement tend to balance and negative each other, and the general statement thus becomes constantly modified towards the exact truth. When one is tempted to declare that conclusions based upon these statistics of consumption are "groundless" † because they do not coincide with what he believes is the "general clinical experience,"† he should reflect that these statistics *are* the "general clinical experience." The facts I have used relative to consumption in Colorado include those from the clinical experience of such good men as Dr. Ambrook of Boulder, and Dr. Horn of Colorado Springs, (and they would have included the results or the clinical experience of other prominent physicians in Colorado if they had responded to my request by giving me such facts). To be sure we have for Colorado only the facts respecting the *deaths* from consumption, but for the State of Michigan we have the records of the *sickness* according to the "clinical experience" of the leading physicians of the State, because we have, for many years, their weekly reports of sickness under their immediate observation. That is the basis for the curve in Diagram No. 7, page cxxxvii, representing sickness from consumption and its relation to the atmospheric temperature. The "clinical experience" of nearly all of our army surgeons during the last great war is represented by the curve for deaths from consumption in a diagram published in the Journal of the Am. Med. Assoc., Jan. 18, 1890, and which is almost identically the curve in Diagram No. 4 which I now present (page cxxxiv) and which represents the deaths from consumption in 31 cities in the United States. In the Diagram No. 8, page cxxxviii, is a curve correctly representing the sickness from pneumonia according to the combined "clinical experience" of all of our army surgeons during the last great war. It proves conclusively that sickness from pneumonia was quantitatively related to atmospheric temperature.

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* Hosea, Chapter iv, verse 6.
† Jour. of Am. Med. Asso., 1890. page —.

One point I wish to make in this connection is that "clinical experience" is generally valuable in proportion as conclusions from it can be based, not on one experience which may be exceptional, nor on a few experiences which still may not teach the exact truth, but upon large numbers of experiences properly classified, arranged, and consolidated into what we call statistics.

On this same principle, the vital statistics of Colorado should be studied in connection with the statistics in other States and countries. The statistics of consumption should be studied in connection with the statistics of other diseases. It seems to me that a careful study of the subject of this paper, in this manner, taking into account work done heretofore, leads to the general conclusion expressed at its beginning,—"that certain meteorological conditions are related closely and causally to all the important ordinary diseases of the lungs and air-passages," and to all communicable diseases like consumption, small-pox, etc., which usually enter the body by way of the air-passages; the evidence is still "of such a character as to lead me to think that similar causal relations prevail throughout the world."

In Colorado, as in other parts of the world, deaths from consumption result from experiencing an atmosphere that is cold and dry, absolutely. In Colorado, at least, the *saturation* of the air with vapor of water apparently increases, and the reverse of this process decreases the unfavorable effects of a cold atmosphere,—toward the causation of deaths from consumption. In Colorado as elsewhere, the danger from consumption is much greater in winter than in summer; that is to say, it is greater in cold weather than in warm weather. My own belief is that this will probably be found to be a universal law. If so, it has an important bearing upon human life and health.

It is of such great importance that this law, if it is a law, shall be established on a firm scientific basis that, in this paper, I refrain from complicating the study of it with any question whether the relations of these meteorological conditions to diseases of the lungs and air-passages are direct or indirect.

I do not claim that this is a newly-discovered law. I have known it for several years. Apparently it was well known to Hippocrates,* so far as relates to temperature and relative humidity, although, in his day, he could not have had any accurate thought of absolute atmospheric humidity, and he must have assumed, as many who are ignorant of the subject now do, that the relative or *apparent* humidity coincides with the absolute humidity, which, generally, is the reverse of the truth, as is shown by the tables and diagrams which I present herewith. But no natural law is of use to mankind until it is established, accepted, and acted upon. My sincere hope is that members of this association will devote sufficient attention to this subject to settle the question definitely and for all time; because it is not only a primary question, it is a fundamental question in biological climatology, and without the settlement of such questions there can be no science of climatotherapy, nor of sanitary climatology.

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* "Set forth in his book on 'Airs, Waters and Places,' namely that cold and damp weather produces diseases of the respiratory organs." John S. Billings, M. D., in Introduction to Buck's Hygiene, Vol. 1, page 34.

DISCUSSION.

A part of the discussion in the American Climatological Association, following the reading of the foregoing paper, is here given because the very important information of the causal relation of the wind to deaths from consumption is not dwelt upon in the paper. As explained by E. Fletcher Ingalls, M. D., of Chicago, in the discussion following the paper, the data relative to the wind were not in the possession of the writer of the paper until after his arrival in Denver. The author not having a large diagram prepared, Dr. Ingalls was kind enough to make one on the blackboard, and to point out to the members of the association how strikingly the line representing the velocity of the wind served, apparently, to explain what otherwise in the line representing the consumption in Colorado, seemed erratic departures from the somewhat regular curve.

Dr. Ingalls. Mr. President, I have been exceedingly interested in this; and I have very little to say, except that I want to call the attention of the Association to something that the doctor merely glanced at in passing. As we came on from Chicago, the doctor was speaking to me of his charts; this wind-line was not in any of his charts, and he did not know anything about it then. He pointed out to me the relation of the death-rate to the temperature; but he says, (pointing to the line representing consumption in Colorado, in the months of April, September and December, on Diagram 1, page cxxxi) "there is a point, and there is a point, and there is a point; I don't know what is the matter. I don't know what causes that; and I am going to see if I can find out anything more."

It seems to me exceedingly interesting that the wind-line seems to account for this irregularity in his line representing the death-rate, that he was not able to account for in any other way. The changes in the velocity of the wind precede the changes in the death-rate by about a month, in most cases; thus [in Diagram 5, page cxxxv] the fall in the line representing wind in February precedes the line representing consumption about a month, the rise in March and April precedes by about a month the rise in the line representing consumption in April and May; and the fall in the line for wind in August and September is followed in September by the fall in the line representing consumption.

Dr. Denison. (Referring to sketch on the blackboard,—[Diagram No. 5, page cxxxv].) Does the down-stroke of the dotted line correspond with the up-stroke of the other in time?

Dr. Baker. No. The reverse of that, as a rule, as stated by Dr. Ingalls, who stated it correctly. Under November, this point here, in the dotted line representing the wind [Diagram No. 5, page cxxxv] coincides with the solid line representing consumption—both lines rising to November and falling to December. This rise in the wind in March, however, precedes the rise in consumption just one month. The rise of the wind in March and April seems to have causal relation to the rise of consumption in April and May, and no other meteorological condition studied has such relation to the extent of controlling the disease. In September and in December the fall of the curve representing the wind is coincident with the fall of the one representing the mortality from consumption, and the fall or decrease in the wind is such, quantitatively, as would be expected to have influenced the decrease in the consumption. And, although the fall in the relative humidity may have had influence in September, no meteorological condition studied, other than the wind, accounts for the decrease in consumption in December.

I think that this Diagram [No. 5, page cxxxv] when taken in connection with the others (Diagrams 1, 2, and 3) relating to Colorado, supplies, for the first time, conclusive evidence that the wind has causal relations to deaths from consumption.

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Dr. Baker. (In reply to question) As to the exact number of deaths, I don't find it stated in the tables, but before the paper is printed I will supply it.

I see [by Table 1, page cxxviii] there are about 40 deaths per month; that would make 480 deaths—probably about 500 deaths only; but to me the evidence is quite conclusive, that we have the facts before us.

[On later more careful examination of the table, there are found to be 451 deaths altogether, and, in equalizing the months, six are lost, leaving 445. This does not change my conclusion. I believe that the data are sufficient to demonstrate causal relations between the meteorological conditions named and the mortality from consumption, in Colorado, as in all other localities yet studied.—HENRY B. BAKER.]

PRINCIPAL METEOROLOGICAL CONDITIONS IN MICHIGAN IN 1890.

COMPARISONS OF CONDITIONS IN 1890 WITH THOSE IN PRECEDING YEARS.

A COMPILATION OF REPORTS BY OBSERVERS FOR THE STATE BOARD OF HEALTH AND FOR THE UNITED STATES SIGNAL SERVICE.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

In the Annual Reports of this Board, there has been published for each of the years 1877 to 1889, inclusive, a summary relative to the principal meteorological conditions as observed during the year. This paper continues the subject for the year 1890. The names of the observers for that year, and the months in that year for which copies of registers of meteorological conditions were received from each, are stated in Exhibit 1, page 2. In Exhibit 2, page 3, is given the latitude, longitude, and elevation of each station. In the tables which follow, reports received from any observer for less than half the year have not been used.

The principal conditions treated in the following tables are temperature and humidity of the air, cloudiness, fogs, rainfall, ozone, velocity and direction of the wind, and pressure of the atmosphere. The tables on each subject are illustrated by diagrams representing to the eye variations in the given condition from month to month through the year, at the several localities represented.

These tables give not only the meteorological conditions for the year and month under consideration, but they also contain, for purposes of comparison, statements of the average conditions for the longest period available in each case.

In the latter part of the Report for 1886, there was published an article on "The Causation of Pneumonia," in which extensive use was made of meteorological statistics, especially those relating to the meteorology of Michigan. In the report for 1887, in an article on "The Causation of the Cold-weather Diseases," influenza, tonsilitis, bronchitis, scarlet fever, diphtheria, and small-pox are proved to sustain very close relations to meteorological conditions. Extensive use of meteorological and sickness statistics is made in the Report for 1887, in an article entitled "The Relations of Certain Meteorological Conditions to Diseases of the Lungs and Air-passages."

In this Report, "Abstract of Proceedings, April 14, 1891," in a discussion on the subject of "The Causation of Influenza," is an important use of meteorological data, with diagrams and other evidence, showing how closely influenza is associated with atmospheric temperature, humidity, ozone and wind.

The article in this Report in relation to "Causes of Diseases," based upon weekly reports of sickness in Michigan, may well be studied in connection with this article, the main purpose of which is to serve as a basis for studies of the causes of diseases.

Incidentally, it is believed that there is nowhere else so complete a statement of the facts relating to the meteorology of Michigan as here presented, for any use for which such knowledge may be needed, now or hereafter.

EXHIBIT 1.—*Names of observers whose Reports are summarized in the following Meteorological Tables and Diagrams, their Places of Observation, and the Counties and Geographical Divisions of the State in which these Places are situated, and months for which reports were received from each observer.*

Name of Observer.	Place of Observation.	County.	Divisions of the State.*	Months (inclusive) for which Registers were Received.
W. W. Dent, Sergt. Signal Corps, U. S. A.	Marquette	Marquette	U. P.	January to December.
Arthur Beebe	Gulliver Lake	Schoolcraft	U. P.	January to December.
Jas. I. Widmeyer, Sergt. Signal Corps, U. S. A.	Manistee	Manistee	N. W.	January to December.
S. E. Wait	Traverse City	G'd Traverse	N. W.	January to December.
James J. Fitz Gerald, Sergt. Signal Corps, U. S. A.	Alpena	Alpena	N. E.	January to December.
D. W. Mitchell, M. D.	Harrisville	Alcona	N. E.	January to December.
Geo. W. Felger, Sergt. Signal Corps, U. S. A.	Grand Haven	Ottawa	W.	January to December.
John W. Kimball	Port Austin	Huron	B. & E.	January to August.
H. L. Boyce, Sergt. Signal Corps, U. S. A.	Port Huron	St. Clair	B. & E.	January to December.
John S. Caulkins, M. D.	Thornville	Lapeer	B. & E.	January to December.
Prof. J. W. Ewing	Alma	Gratiot	C.	January to December.
Prof. R. C. Kedzie	Agr'l College	Ingham	C.	January to December.
Theo. R. Mac Clure	Office State B'd of Health, Lansing	Ingham	C.	January to December.
C. H. Prentiss	Otsego	Allegan	S. W.	January to December.
Prof. Chas. E. Barr	Albion	Calhoun	S. C.	January to December.
Prof. M. W. Harrington	Ann Arbor	Washtenaw	S. C.	January to December.
J. H. Kellogg, M. D.	Battle Creek	Calhoun	S. C.	January to December.
Lieut. A. H. Boies	Hudson	Lenawee	S. C.	January to November.
Geo. C. Palmer, M. D., Supt. Asylum for Insane	Kalamazoo	Kalamazoo	S. C.	January to December.
Geo. H. Greene, M. D.	Marshall	Calhoun	S. C.	January to December.
Lewis Marvill	Parkville	St. Joseph	S. C.	January to December.
C. E. Beers	Tecumseh	Lenawee	S. C.	January to December.
Abner Wilson	Tecumseh	Lenawee	S. C.	April to September.
S. Alexander	Birmingham	Oakland	S. E.	January to December.
Edward A. Evans, Sergt. Signal Corps, U. S. A.	Detroit	Wayne	S. E.	January to December.

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* The counties in each division are stated in Exhibit I. on a subsequent page.

EXHIBIT 2.—*Latitude and Longitude, Elevation above Sea Level, and the Average Temperature, and Average Barometric Pressure in 1890, at 17 Meteorological Stations in Michigan,—the names of the Stations being arranged in order by latitude, highest first.*

Localities in order of Latitude, those farthest North, first.	Latitude North.	Longitude West from Greenwich.	Altitude (Approximate) above Sea Level,—Feet.	Height of Mercury in Cistern of Barometer above Sea Level,—Feet.	Average Temperature, 1890, Degrees Fahr.	Average Atmospheric Pressure, 1890. Inches of Mercury corrected for Temp.
Marquette	46°34'	87°24'	641.42	672.	40.21	29.193
Gulliver Lake	45°59'	86°1'	627.	631.	40.63	29.304
Alpena	45°5'	83°30'	587.	609.	41.79	29.343
Traverse City	44°45'	85°40'	598.	605.	45.54	29.328
Harrisville	44°39'	83°18'	616.	620.	42.83	29.311
Manistee	44°13'	86°18'	600.	615.	44.37	29.354
Port Austin	44°	82°	478.	----------	----------	----------
Alma	43°25'	84°45'	750.	760.	47.39	29.197
Grand Haven	43°5'	86°13'	590.	621.	46.27	29.351
Port Huron	43°	82°26'	602.	639.	45.71	29.357
Thornville	* 42°55'	* 83°10'	§ 975.	§ 980.	48.56	28.949
Agricultural College	42°44'	84°29'	820.	834.	47.60	29.084
Lansing, S. B. of H.	† 42°44'	† 84°33'	¶ 900.	917.	47.89	29.084
Birmingham	42°30'	83°10'	‡ 572.	----------	48.51	29.129
Otsego	42°28'	85°43'	720.	733.	48.77	----------
Detroit	42°20'	83°3'	** 603.9	†† 662.	47.69	29.315
Battle Creek	42°20'	85°11'	----------	----------	----------	----------
Ann Arbor	42°17'	83°44'	930.	936.	48.34	29.038
Marshall	42°17'	84°50'	883.	----------	48.66	29.014
Albion	42°14'	84°45'	965.	965.25	49.22	28.953
Kalamazoo	42°13'	85°35'	944.	955.	48.07	29.034
Tecumseh	42°1'	83°57'	----------	----------	49.44	29.127
Hudson	41°35'	84°21'	970.	----------	----------	----------

* Estimated from lines on a map of Michigan issued by the General Land office, Department of the Interior, 1878. For stations having no reference mark, the latitude and longitude were stated by the observer on the meteorological reports received.

† The exact latitude and longitude of the astromical post placed in the ground near the new Capitol at Lansing by the U. S. Lake Survey in 1875, as determined by the observations then made, is 42°43' 53.11" N. and 84°33' 19.68" W.

‡ Estimated from data on "Railroad Profiles," pages 179-187, Annual Report of the State Board of Health for 1878.

§ Estimated from data in Tackabury's Atlas of the State of Michigan.

¶ Estimated from comparisons of barometrical observations at Lansing, Port Huron, and Grand Haven for the four years, 1879-82.

** 603.7 from Nov. 15 to 30 inclusive, and 599.45 for Dec.

†† 724.45 from Nov. 15 to Dec. 31, inclusive.

NOTE.—Green's standard barometer was used at the above stations for the year 1890.

EXHIBIT 3.—*Average Temperature by Year and Months, for each of the Years, 1877-90, and the Average for the 13 Years, 1877-89. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 13 Yrs., '77-89	46.02	20.49	22.92	29.63	44.17	56.28	65.28	70.78	68.03	61.09	49.49	36.32	27.77
1877	48.67	19.18	32.27	25.92	46.71	58.24	67.48	72.80	70.52	63.80	52.78	37.57	36.73
1878	49.24	27.17	29.75	41.46	52.27	54.73	65.18	74.22	70.92	63.99	50.18	38.34	22.74
1879	46.82	20.86	20.69	33.06	44.29	58.03	64.70	73.16	68.99	57.43	57.43	36.80	26.41
1880	46.55	34.06	27.98	31.00	44.39	62.27	67.41	69.39	68.07	59.54	46.69	27.34	20.67
1881	47.23	14.93	19.75	29.36	40.53	62.72	63.32	72.95	71.76	67.99	51.87	37.42	34.03
1882	47.14	24.82	33.42	34.12	42.65	51.04	64.43	67.84	69.05	61.70	53.53	37.90	25.73
1883	48.52	15.78	20.03	24.63	43.00	51.87	64.73	68.36	65.41	57.24	46.78	38.10	26.89
1884	44.72	15.14	20.94	28.78	42.00	54.38	67.04	66.70	66.10	64.72	51.56	34.53	24.77
1885	42.36	15.46	10.21	19.51	41.39	53.32	63.39	71.13	63.23	59.14	45.78	38.14	27.59
1886	44.82	18.72	21.18	30.10	46.04	54.09	63.31	68.68	67.36	61.15	51.84	34.32	20.44
1887	44.82	16.58	21.57	25.55	42.09	60.68	66.53	73.22	66.41	57.95	44.46	35.18	27.57
1888	45.03	15.93	21.65	25.89	42.81	53.40	68.08	70.95	68.05	58.20	46.01	38.73	30.70
1889	47.36	28.18	18.57	35.83	46.04	56.74	63.05	70.69	68.58	61.36	44.59	37.95	36.76
1890	46.99	30.06	30.07	27.47	45.23	52.41	69.93	71.29	65.25	58.06	48.88	38.60	26.65

EXHIBIT 4.—*Average Temperature by Year and Months, for each of the Years, 1879-90, and the Average for the 11 Years, 1879-89, at the Office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 11 Yrs., '79-89	47.16	21.13	23.35	31.21	45.94	58.77	67.34	72.49	68.95	61.56	50.21	37.01	27.99
1879	48.87	21.78	22.49	36.27	47.54	60.88	67.71	75.86	70.65	58.11	59.50	38.22	27.46
1880	48.94	36.81	31.62	34.19	47.46	65.48	69.44	71.69	70.38	61.19	48.64	28.78	21.65
1881	49.59	16.98	22.27	30.59	43.23	66.94	65.99	75.41	74.63	71.33	53.63	38.78	35.28
1882	49.23	25.65	35.88	36.14	44.83	53.10	66.86	72.57	71.84	63.64	55.63	39.00	26.13
1883	45.69	17.01	22.07	28.04	46.42	53.28	66.98	70.42	67.78	59.42	48.31	40.09	28.47
1884	47.43	16.48	23.89	32.26	45.30	58.20	70.69	69.77	68.58	67.99	53.47	36.51	26.01
1885	43.01	15.85	10.49	21.57	43.97	55.71	65.26	73.35	63.28	55.86	45.43	38.21	27.14
1886	46.19	19.02	22.44	32.09	50.16	57.77	66.20	70.87	68.49	61.81	51.78	34.02	19.61
1887	46.69	18.26	24.39	27.81	45.27	64.24	69.44	75.76	67.06	58.66	45.19	36.59	27.63
1888	45.49	15.63	22.38	27.49	44.30	58.91	68.80	71.09	67.77	57.79	46.32	39.16	31.19
1889	47.65	29.00	18.89	36.81	46.91	56.99	63.36	70.59	68.46	61.32	44.89	37.71	37.31
1890	47.89	31.63	31.51	28.53	46.86	58.94	71.03	71.81	65.38	57.97	49.09	39.46	27.48

EXHIBIT 5.—*Average Temperature by Year and Months, for each of the Years 1864-90, and the Average for the 26 Years, 1864-89, at the Agricultural College, Michigan.*

Years, etc.	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 26 Yrs., '64-89	46.44	21.58	23.49	31.02	45.68	58.13	67.51	71.54	68.71	60.28	48.07	35.51	26.03
1864	47.32	22.26	27.82	31.74	45.86	60.19	67.62	74.52	70.72	59.62	45.74	37.88	24.27
1865	48.12	21.10	27.59	39.96	47.40	57.65	70.76	65.60	65.84	67.66	46.50	38.63	27.72
1866	45.60	21.16	22.71	29.60	48.94	55.04	66.60	71.72	62.60	55.80	49.50	37.94	25.53
1867	46.91	17.61	30.89	29.72	48.20	51.11	71.61	71.60	69.78	56.60	50.60	40.44	25.31
1868	46.34	19.00	18.72	37.80	43.68	59.08	68.46	77.19	70.33	58.77	45.19	36.77	21.16
1869	46.27	29.38	26.66	27.60	45.70	56.02	64.45	70.35	70.58	63.45	40.80	32.05	28.16
1870	49.11	25.37	24.25	30.28	50.89	64.32	70.87	74.40	70.11	68.66	52.45	38.40	24.80
1871	47.93	24.75	25.65	38.18	50.13	61.39	68.21	70.60	71.19	58.10	53.91	31.95	21.12
1872	45.54	21.59	21.34	24.75	47.39	58.48	71.82	74.91	71.22	62.08	47.44	29.80	15.74
1873	44.54	15.87	19.10	28.30	43.17	56.98	70.60	70.82	69.49	57.38	44.68	28.49	29.54
1874	47.05	27.70	25.51	32.30	36.87	59.58	70.61	72.02	69.89	62.85	49.10	35.00	26.96
1875	43.06	12.87	7.99	26.20	41.11	60.82	66.57	69.67	65.48	58.50	42.93	32.96	31.58
1876	46.17	30.22	27.38	30.55	44.16	57.95	68.14	72.48	71.55	56.30	43.74	36.38	15.23
1877	47.42	18.07	32.31	24.51	46.16	58.25	65.93	71.43	68.46	61.28	50.83	35.24	36.57
1878	48.29	29.11	28.07	40.90	50.55	54.57	64.08	73.04	70.15	63.15	48.33	36.29	21.29
1879	46.88	19.19	20.40	33.19	44.84	58.76	66.02	74.03	70.00	56.21	57.28	38.22	27.46
1880	47.32	37.10	29.19	35.50	45.87	64.30	67.60	68.04	68.58	55.83	46.23	27.52	22.07
1881	48.73	16.98	21.58	30.28	45.59	65.24	64.31	73.43	72.69	69.69	52.51	38.20	34.31
1882	47.57	24.89	35.12	35.96	44.70	52.73	66.49	67.71	69.52	59.98	52.67	36.30	24.80
1883	43.52	14.39	19.76	24.89	43.48	52.98	65.87	68.94	64.90	56.43	46.17	38.08	26.39
1884	45.66	15.46	23.43	29.89	43.66	56.90	68.92	67.95	66.91	65.06	50.91	34.11	24.71
1885	42.90	15.34	8.94	21.26	43.59	55.76	64.69	72.70	63.62	58.94	44.95	37.22	27.75
1886	46.20	18.78	22.27	31.33	50.18	58.96	65.72	70.68	69.30	62.07	52.37	33.94	19.74
1887	46.60	18.20	24.26	28.29	45.37	64.28	68.53	75.51	67.96	58.86	44.97	35.66	27.30
1888	45.08	15.40	21.95	27.03	44.03	53.65	67.89	70.53	67.55	57.76	45.70	38.50	30.89
1889	47.33	28.04	18.25	36.51	46.59	57.37	62.83	70.19	68.56	61.24	44.19	37.39	36.75
1890	47.60	31.54	31.54	28.15	47.08	58.69	70.40	71.04	65.42	57.76	49.11	39.06	26.45

EXHIBIT 6.—*Statements of Meteorological Conditions in the Year and in each Month of the Year 1880, Compared with the Annual and Monthly Averages for 1889, and for several Stated Periods of Years. These statements and Averages are for* **Groups of Several Stations in Michigan.**

Meteorological Conditions.	1890 Compared with Averages for Previous Years.		In 1890 More (+), or Less (-), than in 1889.	Meteorological Conditions.	1890 Compared with Averages for Previous Years.		In 1890 More (+), or Less (-), than in 1889.
	No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.			No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.	
YEAR 1890.				YEAR 1890.			
Av. Temp.	13	+.97°	—.37°	*Continued.*			
Range of Temp.*	13	0	+6°	Cloudiness	13	0	0
Av. Monthly Range of Temp.*	13	0	+5°	Rainfall	13	—5.13 in.	+2.02 in.
Av. Daily Range of Temp.*	11	—.77°	—.08°	Atmospheric Pressure	13	—.034 in.	—.002 in.
JANUARY.				FEBRUARY.			
Av. Temp.	13	+9.57°	+1.88°	Av. Temp.	13	+7.15°	+11.50°
Range of Temp.*	13	+5°	+20°	Range of Temp.*	13	—6°	—1°
Av. Daily Range of Temp.*	11	—.95°	+1.29°	Av. Daily Range of Temp.*	11	—4.00°	—3.33°
Cloudiness	13	+2 per ct.	0	Cloudiness	13	+5 per ct.	—1 per ct.
Rainfall	13	+1.86 in.	+1.11 in.	Rainfall	13	—.19 in.	+.36 in.
Atmospheric Pressure	13	—.006 in.	+.119 in.	Atmospheric Pressure	13	—.077 in.	—.060 in.
MARCH.				APRIL.			
Av. Temp.	13	—2.16°	—8.36°	Av. Temp.	13	+1.06°	—.81°
Range of Temp.*	13	+6°	+25°	Range of Temp.*	13	—4°	+18°
Av. Daily Range of Temp.*	11	—1.96°	—.82°	Av. Daily Range of Temp.*	11	+1.38°	+1.94°
Cloudiness	13	—2 per ct.	+7 per ct.	Cloudiness	13	—8 per ct.	—11 per ct.
Rainfall	13	—.18 in.	+1.11 in.	Rainfall	13	+.91 in.	+1.75 in.
Atmospheric Pressure	13	—.020 in.	+.043 in.	Atmospheric Pressure	13	+.060 in.	+.079 in.
MAY.				JUNE.			
Av. Temp.	13	—3.87°	—4.33°	Av. Temp.	13	+4.65°	+6.88°
Range of Temp.*	13	+8°	—2°	Range of Temp.*	13	+4°	+9°
Av. Daily Range of Temp.*	11	—2.59°	—1.28°	Av. Daily Range of Temp.*	11	—.47°	+1.96°
Cloudiness	13	+11 per ct.	+6 per ct.	Cloudiness	13	0	—20 per ct.
Rainfall	13	+1.38 in.	+.59 in.	Rainfall	13	—.22 in.	—.08 in.
Atmospheric Pressure	13	—1.01 in.	+.040 in.	Atmospheric Pressure	13	—.021 in.	—.011 in.

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* By registering thermometers.

Comments on Exhibit 6 are printed on pages 7 and 9.

The high temperature for January, and the small amount of rainfall for the year 1890, are especially noticeable.

EXHIBIT 6.—CONTINUED.—*Meteorological conditions at Stations in Michigan, in Months for the Year 1890, Compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1890 Compared with Averages for Previous Years.		In 1890	Meteorological Conditions.	1890 Compared with Averages for Previous Years.		In 1890
	No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.	More (+), or Less (-), than in 1889.		No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.	More (+), or Less (-), than in 1889.
JULY.				AUGUST.			
Av. Temp.	13	+.51°	+.60°	Av. Temp.	13	—2.75°	—3.30°
Range of Temp.*	13	+1°	—2°	Range of Temp.*	13	+7°	—9°
Av. Daily Range of Temp.*	11	+.66°	+.17°	Av. Daily Range of Temp.*	11	—.05°	—1.44°
Cloudiness	13	—6 per ct.	—2 per ct.	Cloudiness	13	0	+10 per ct.
Rainfall	13	—1.89 in.	—1.60 in.	Rainfall	13	+.48 in.	+2.65 in.
Atmospheric Pressure	13	—.007 in.	+.011 in.	Atmospheric Pressure	13	+.014 in.	—.024 in.
SEPTEMBER.				OCTOBER.			
Av. Temp.	13	—3.08°	—3.30°	Av. Temp.	13	—.61°	+4.29°
Range of Temp.*	13	—2°	—5°	Range of Temp.*	13	—9°	—6°
Av. Daily Range of Temp.*	11	—.20°	—.92°	Av. Daily Range of Temp.*	11	—2.56°	—2.31°
Cloudiness	13	+3 per ct.	+6 per ct.	Cloudiness	13	+13 per ct.	+13 per ct.
Rainfall	13	—1.24 in.	+.24 in.	Rainfall	13	+1.69 in.	+3.87 in.
Atmospheric Pressure	13	+.029 in.	+.089 in.	Atmospheric Pressure	13	—.164 in.	—.290 in.
NOVEMBER.				DECEMBER.			
Av. Temp.	13	+2.28°	+.65°	Av. Temp.	13	—1.12°	—10.11°
Range of Temp.*	13	—1°	+13°	Range of Temp.*	13	—11°	—7°
Av. Daily Range of Temp.*	11	+.39°	+2.91°	Av. Daily Range of Temp.*	11	+1.14°	+.92°
Cloudiness	13	—7 per ct.	—11 per ct.	Cloudiness	13	—10 per ct.	+2 per ct.
Rainfall	13	—.67 in.	—.67 in.	Rainfall	13	—1.02 in.	—1.26 in.
Atmospheric Pressure	13	—.063 in.	—.023 in.	Atmospheric Pressure	13	—.049 in.	—.012 in.

* By registering thermometers.

METEOROLOGICAL CHARACTERISTICS OF THE YEAR 1890 IN MICHIGAN.

At the several meteorological stations, in different parts of the State, the average temperature for 1890 was .97° higher than the average for the preceding 13 years; the annual range of temperature was 6° greater than in 1889, and the same as the annual average range for the preceding 13 years; the average monthly range of temperature was 5° greater than in 1889 and the same as the average for the preceding 13 years; the average daily range of temperature .08° less than in 1889 and .77° less than the average for the preceding 11 years; the average cloudiness was the same as in 1889 and the same as the average for the preceding 13 years; the rainfall (rain and melted snow) was 2.02 inches greater than in 1889 and 5.13 inches less than the average for the preceding 13 years; the average atmospheric

EXHIBIT 7.—*Statements of Meteorological Conditions in the Year and in each Month of the Year 1890, Compared with Annual and Monthly Averages for 1889, and for several stated Periods of Years—from Observations by Prof. R. C. Kedzie,* **at the State Agricultural College, near Lansing, Michigan.**

Meteorological Conditions.	1890, Compared with Averages for Previous Years.		In 1890	Meteorological Conditions.	1890, Compared with Averages for Previous Years.		In 1890
	No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.	More (+), or Less (-), than in 1889.		No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.	More (+), or Less (-), than in 1889.
YEAR 1890.				YEAR 1890.			
Av. Temp.	26	+1.16°	+27°	*Continued.*			
Range of Temp.*	17	—12°	—7°	Cloudiness	26	—3 per ct.	—1 per ct.
Av. Monthly Range of Temp.*	17	—3°	0	Rainfall	26	+.23 in.	+7.84 in.
Av. Daily Range of Temp.*	16	—1.20°	—.65°	Atmospheric Pressure	15	+.018 in.	+.022 in.
JANUARY.				FEBRUARY.			
Av. Temp.	26	+10.01°	+8.50°	Av. Temp.	26	+8.05°	+13.29°
Range of Temp.*	17	+1°	+12°	Range of Temp.*	17	—11°	—8°
Av Daily Range of Temp.*	16	—1.28°	+.45°	Av. Daily Range of Temp.*	16	—5.87°	—7.38°
Cloudiness	26	—1 per ct.	—1 per ct.	Cloudiness	26	+4 per ct.	+4 per ct.
Rainfall	26	+.46 in.	+.78 in.	Rainfall	26	—.26 in.	+.62 in.
Atmospheric Pressure	15	+.067 in.	+.251 in.	Atmospheric Pressure	15	0	—.018 in.
MARCH.				APRIL.			
Av. Temp.	26	—2.87°	—8.36°	Av. Temp.	26	+1.40°	+.49°
Range of Temp.*	17	—4°	—1°	Range of Temp.*	17	—6°	+1°
Av. Daily Range of Temp.*	16	—2.58°	—3.91°	Av. Daily Range of Temp.*	16	+1.45°	+2.37°
Cloudiness	26	—6 per ct.	+5 per ct.	Cloudiness	26	—10 per ct.	—10 per ct.
Rainfall	26	—.94 in.	+.32 in.	Rainfall	26	+.85 in.	+1.18 in.
Atmospheric Pressure	15	+.045 in.	+.060 in.	Atmospheric Pressure	15	+.105 in.	+.081 in.
MAY.				JUNE.			
Av. Temp.	26	—4.44°	—3.68°	Av. Temp.	26	+2.89°	+7.57°
Range of Temp.*	17	—1°	—4°	Range of Temp.*	17	+2°	+7°
Av. Daily Range of Temp.*	16	—4.38°	—.61°	Av. Daily Range of Temp.*	16	—1.12°	+3.43°
Cloudiness	26	+7 per ct.	+6 per ct.	Cloudiness	26	0	—15 per ct.
Rainfall	26	+1.86 in.	+1.37 in.	Rainfall	26	—.19 in.	+.20 in.
Atmospheric Pressure	15	—.076 in.	—.087 in.	Atmospheric Pressure	15	+.019 in.	+.020 in.

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.
Comments on Exhibit 7 are printed on page 10.
The high temperature for January, and the small amount of rainfall for July, are especially noticeable.

EXHIBIT 7.—CONTINUED.—*Meteorological Conditions at the Agricultural College, in Months, for the Year 1890, compared with Averages for Corresponding Months in Preceding Years.*

Meteorological Conditions.	1890, Compared with Averages for Previous Years.		In 1890 More(+), or Less (-), than in 1889.	Meteorological Conditions.	1890, Compared with Averages for Previous Years.		In 1890 More (+), or Less (-), than in 1889.
	No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.			No. of Years Averaged, end'g with 1889.	More (+), or Less (-), in 1890 than the Average for Previous Years.	
JULY.				AUGUST.			
Av. Temp.	26	—.50°	+.85°	Av. Temp.	26	—3.29°	—3.14°
Range of Temp.*	17	+1°	+6°	Range of Temp.*	17	+10°	+12°
Av. Daily Range of Temp.*	16	—.56°	+1.39°	Av. Daily Range of Temp.*	16	—.18°	—1.25°
Cloudiness	26	—12 per ct.	—9 per ct.	Cloudiness	26	—4 per ct.	+10 per ct.
Rainfall	26	—2.42 in.	—2.49 in.	Rainfall	26	+.91 in.	+2.92 in.
Atmospheric Pressure	15	+.035 in.	+.036 in.	Atmospheric Pressure	15	+.045 in.	—.018 in.
SEPTEMBER.				OCTOBER.			
Av. Temp.	26	—2.52°	—3.48°	Av. Temp.	26	+1.04°	+4.92°
Range of Temp.*	17	+4°	—6°	Range of Temp.*	17	—6°	—5°
Av. Daily Range of Temp.*	16	+.48°	—2.47°	Av. Daily Range of Temp.*	16	—2.21°	—4.93°
Cloudiness	26	0	+8 per ct.	Cloudiness	26	+11 per ct.	+6 per ct.
Rainfall	26	—1.29 in.	+.88 in.	Rainfall	26	+2.04 in.	+3.92 in.
Atmospheric Pressure	15	+.079 in.	+.120 in.	Atmospheric Pressure	15	—.108 in.	—.176 in.
NOVEMBER.				DECEMBER.			
Av. Temp.	26	+3.55°	+1.67°	Av. Temp.	26	—.42°	—10.30°
Range of Temp.*	17	—12°	—5°	Range of Temp.*	17	—16°	—8°
Av. Daily Range of Temp.*	16	+1.07°	+4.47°	Av. Daily Range of Temp.*	16	+.33°	+.68°
Cloudiness	26	—10 per ct.	—15 per ct.	Cloudiness	26	—13 per ct.	+7 per ct.
Rainfall	26	+.02 in.	—.37 in.	Rainfall	26	—.84 in.	—1.49 in.
Atmospheric Pressure	15	—.001 in.	+.020 in.	Atmospheric Pressure	15	+.009 in.	+.030 in.

* By registering thermometers, set at 7 A. M., and recorded at 7 A. M., for the preceding calendar day.

pressure was .002 of an inch less than in 1889 and .034 of an inch less than the average for the preceding 13 years.

In Exhibit 6, pages 6 and 7, is given by year and months, a comparison of conditions in 1890, in Michigan, with those in 1889, and with the averages for periods of years. January, February, June, November, April and July (naming the months in the order of greatest difference) were the months in which the average temperature in 1890 was higher than the average for corresponding months in the preceding 13 years; May, September, August, March, December and October were months in which the average temperature in 1890 was lower than the average for corresponding months in the preceding 13 years.

METEOROLOGICAL CHARACTERISTICS* OF THE YEAR 1890, AT ONE CENTRAL STATION.

At the State Agricultural College, near Lansing, and near the center of the thickly-settled part of the State, the average temperature for 1890 was .27° higher than for 1889, and 1.16° higher than the average for the preceding 26 years; the annual range of temperature was 7° less than in 1889 and 12° less than the annual average range for the preceding 17 years; the average monthly range of temperature was the same as in 1889 and 3° less than the average for the preceding 17 years; the average daily range of temperature was .65 less than in 1889, and 1.20 less than the average for the preceding 16 years; the average cloudiness was 1 per cent less than in 1889, and 3 per cent less than the average for the preceding 26 years; the rainfall (rain and melted snow) was 7.84 inches greater than in 1889 and .23 inches greater than the average for the preceding 26 years; the average atmospheric pressure was .022 of an inch greater than in 1889, and .018 of an inch greater than the average for the preceding 15 years.

In Exhibit 7, pages 8 and 9, is given by year and months, a comparison of conditions in 1890, at the Agricultural College, with those in 1889, and with averages for periods of years. January, Februrary, November, June, April and October (naming months in order of greatest difference) were months in which the average temperature in 1890 was higher than average for corresponding months in the preceding 26 years; May, August, March, September, July, andDecember were months in which the average temperature in 1890 was lower than the average for corresponding months in the preceding 26 years, at that station which is near the central part of the State.

Whoever will carefully study Diagram No. 1 (p.) in this article and in similar articles for preceding years, will see that thermometers and methods of observation have become so perfect that, given a curve representing correctly the temperature by months at one station in Michigan, curves can readily be constructed without actual records which will somewhat closely represent the temperature at each of several other stations, because the curves for many stations run so nearly parallel that all that is necessary to do is to find the average difference of mean annual temperature at the station to be represented compared with the station for which the data are given. It may also be seen that a curve representing the temperature at a station in the central part of the State very closely resembles the curve representing the average for many stations representing nearly all parts of the State. This proves that the practice adopted many years ago of stating the meteorological characteristics at one central station is a reasonably safe practice, and it is especially useful when it enables us to gain a comparison for a longer period than can be made from records at many stations, and also when employed in advance of the receipt of records from all stations, as is the case when the weekly bulletins of "Health in Michigan" are issued, for the purposes, for which the meteorological conditions at the State Capitol are used to represent the conditions probably prevailing throughout the State.

LOCAL METEOROLOGICAL PHENOMENA IN THE SEVERAL MONTHS OF THE YEAR 1890.

The following general remarks relative to temperature, frosts, effects on vegetation, migration of birds, etc., in 1890, are taken from the monthly reports by observers. The names of stations are appended; the names of observers are stated in Exhibit 1, page 2.

JANUARY.

Jan. 7, first day temperature below zero. Greatest change in barometer in 7 hours, at this station (.61 inch), Jan. 13. Trees loaded with frost in morning, Jan. 28.

Snow on ground 12 inches. Month remarkable for rapid change in barometer and temperature.—*Gulliver Lake.*

Frosts, Jan. 7, 15, 18, 31. Bay and river frozen over, Jan. 16; navigation closed; ground frozen about 13 inches. Melting snow on ground, Jan. 6, 12, 13, 15, 24, 25, 26, 27, 28, 29, 30, 31.—*Alpena.*

Melting snow on ground, Jan. 9, 25, 26.—*Grand Haven.*

Ground bare and but little frost in it, Jan. 1. Lighthouse closed, Jan. 15. Wild geese flying north, Jan. 25 and 27. White frost in A. M., Jan. 30; ground bare; no ice to prevent navigation.—*Port Austin.*

Nights that did not freeze, Jan. 1, 4, 9, 12. Highest barometer noted for many years (29.73), Jan. 3, 2 P. M. Inappreciable snow, Jan. 8, 17, 21. Sudden rise in barometer, (.82 of an inch), in 14 hours, Jan. 13.

January was a warm month for the season, the warmest since 1880. The mean temperature was about 10° above the normal. There was no sleighing. Much rain and mud. Very little ice on the ponds or in open ground and none in the woods.—*Thornville.*

No snow on ground, no frost in ground, Jan. 12.—*Otsego.*

No snow on ground, January 31.—*Ann Arbor.*

Farmers were plowing in the fields Jan. 1, and more or less was done throughout the month. No snow on ground Jan. 31.—*Hudson.*

No snow on ground, Jan. 15 and 31.—*Tecumseh.*

Wheat and grass have grown considerably during this month. Pansies have been in full bloom in some localities. There are instances of peach trees being in full bloom in this locality.—*Birmingham.*

Spring birds appeared, Jan. 28. Bees were out on Jan. 2, 11, 18, 19, 27, 31. Ground bare, Jan. 31.—*Parkville.*

Frosts, Jan. 3, 4, 8, 19, 22, 28, 30. Grand river frozen over in places, Jan. 17. Grand river closed, Jan. 22; second time this season. No snow on ground, Jan. 15 and 31.—*Lansing.*

FEBRUARY.

Depth of snow on ground 12 inches, Feb. 14; 23 inches, Feb. 28. No ice has formed on Lake Michigan, Feb. 28.—*Gulliver Lake.*

Frosts, Feb. 1, 2, 6, 7, 8, 15, 16, 22, 23. Melting snow on ground, Feb. 3, 4, 11, 12, 13, 14, 16, 22, 23, 24, 25. The ground is frozen about 16 inches. Navigation is considered open on this lake. The first boat of the season, steam barge Jenks, light, from Port Huron, arrived at this port on the morning of Feb. 28. She came here for a cargo of ice for Port Huron parties. The captain reported very little ice on Lake. Thunder Bay and river are partly frozen over.—*Alpena.*

About 5 inches of snow on ground, Feb. 28.—*Harrisville.*

Melting snow on ground, Feb. 10, 12, 23, 24.—*Grand Haven.*

The water in the lake has fallen 6 inches since October 1889, Feb. 11. A steamboat passed up, Feb. 13.—*Port Austin.*

Snow melted rapidly during day, Feb. 12. Ground frozen to a depth of 3 inches, Feb. 28.—*Port Huron.*

Nights that did not freeze, Feb. 2, 3, 17. Trees covered with rime, Feb. 11. Trees covered with ice, Feb. 28. Feb., though a little colder than Jan., was very mild, the mean being about 8 degrees above the normal. There was no sleighing and not so much rain as in Jan. At the close, there is from 2 to 3 inches of ice on the ponds; a little in open grounds but none in the woods; like Jan. it is the warmest since 1880.—*Thornville.*

Frosts, Feb. 2, 6, 7, 11, 13, 15, 16, 17, 19, 24, 25. Grand River open, Feb. 3. Ground bare, Feb. 15. Snow sufficient to whiten ground, Feb. 28.—*Lansing.*

Light frosts, Feb. 2, 15; robins and all other birds appeared; no frost in ground.—*Otsego.*

A very warm month; not snow enough for even a day's sleighing; much of the time no frost in the ground. No ice has been gathered at this station during the winter; streams have not frozen over and lakes only partially, so that ducks have remained in them nearly every week throughout the winter. Robins, blue birds and song sparrows were observed, Feb. 16 and 17, but disappeared upon the arrival of the cold wave of Feb. 18. Robins again seen, Feb. 24.—*Hudson.*

No snow on ground, Feb. 15 and 28.—*Tecumseh.*

Spring song birds present.—*Birmingham.*

Bees were out, Feb. 4, 10, 11, 13, 15, 16, 17, 24. Wild geese seen, Feb. 25. The ground has been bare, with the exception of 2 or 3 days throughout the month.—*Parkville.*

MARCH.

Lake Michigan frozen beyond limit of vision, Mar. 7.

Lake Michigan clear of ice, Mar. 13.

First song sparrows and blue jays, Mar. 27.

Depth of snow on ground 20 inches, Mar. 31.—*Gulliver Lake.*

Grand Traverse Bay frozen over, night of Mar. 7.—*Traverse City.*

Frosts, Mar. 5, 6, 7, 8, 17, 20, 23. Heavy frost, Mar. 9. Melting snow on ground, Mar. 11, 12, 13, 25, 26, 29, 30. Ground frozen about 4 inches. Navigation closed, Mar. 6 and opened. Mar. 31. The first boat of the season—steamer Atlantic, Captain J. Jones, from Detroit, laden with provisions and merchandise, arrived at this port at 12:10 p. m., Mar. 31.—*Alpena.*

Melting snow on the ground, Mar. 8, 9, 10, 16, 17, 19, 20, 30, 31.—*Grand Haven.*

A steamboat passed up, Mar. 17. Robins appeared, Mar. 24. Ice all gone, Mar. 26. Two tugs with tows passed down. Light house opened. Mar. 27. The water in the lake has fallen about 5 inches. No snow on ground except the drifts from the storm of March 28.—*Port Austin.*

Melting snow on ground, Mar. 29, 30, 31. Ground frozen to a depth of 4 inches, Mar. 31.—*Port Huron.*

March—if the snow storm of the 27th had come on the 1st—would have been a month of severe winter weather; as it was, the mean temp. was 11° below that of Jan. Ice formed sufficiently thick to put up, (about 7 inches), on the ponds and about the same in the open ground. There was sleighing after Mar. 27. The repeated freezings and thawings have injured the roots of the clover and wheat. Contrary to the hopes encouraged by the mild winter, the peach buds are badly injured, having probably been too much developed by the warm January to endure the cold of Mar. 5 and 6, although—2° was the lowest limit. —*Thornville.*

Light frosts, March 2, 13, 27, 31. Frost out of the ground, Mar. 11. Spring birds seen, Mar. 21; first blackbirds, Mar. 24. Striped snakes, caterpillars and butterflies seen Dec. 25. No snow on the ground and no frost in the ground, Mar. 31.—*Otsego.*

Crows seen, Mar. 27.—*Kalamazoo.*

Blackbirds appeared, Mar. 17; spring birds, Mar. 24; robins, Mar. 25.—*Parkville.*

Song sparrows, robins and blue birds seen, Mar. 9, 11; purple grackles, Mar. 18; meadow larks and red wing blackbirds, Mar. 25.—*Hudson.*

Frosts, Mar. 1, 2, 3, 5, 6, 7, 8, 9, 13, 14, 15, 18, 21, 23, 27, 31. Grand river opened, Mar. 11. No snow on ground, Mar. 17; 3 inches of snow on ground, Mar. 31.—*Lansing.*

APRIL.

Frosts, April 15, 16, 19, 25, 26, 27, 28, 29. Navigation open at Manistique, April 2. First robins seen, April 8; first butterflies, April 11; first blackbirds, kingbirds and kingfishers, April 12. Frogs first heard, April 15. Gulliver lake clear of ice, April 21. Temperature of Gulliver lake, 42°, 6 a. m., April 22. Four large flocks of geese seen flying north, April 28. Water in Gulliver lake 3 inches below extreme high water of May 15, 1888.—*Gulliver Lake.*

Robins arrive April 3. Navigation open and ice goes out of Grand Traverse bay, April 8.—*Traverse City.*

Light frosts, April 1, 2, 3, 18, 19, 20, 22, 24, 25, 26, 28. Heavy frosts, April 5, 15, 21.—*Alpena.*

Melting snow on ground, April 10.—*Grand Haven.*

Light frosts occurred during nights of 16, 20.—*Port Huron.*

Nights that froze, April 1, 2, 4, 5, 9, 10, 14, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 28, 29. Frogs first heard and snakes seen, April 11. Grass began to grow; hazel bush blossoming, April 2. Apple trees and lilac buds open, April 22. Tamarack leafing, April 25. Black-headed fly catcher and song sparrow seen, April 2; killdeer, April 4; chewink, April 5; blackbirds, April 7; meadow larks, April 14; flicker-mouse, April 15. April was a month of extremes. There was much rain but the weather was mostly pleasant. There were some warm days but nights were generally very cold—too cold for things to grow. The average temperature was fully up to the normal, but vegetation has not made much growth yet. The range of temperature was 57°. There are some pieces of wheat that look well but more that are injured for the lack of winter covering. Peach buds are not at all hurt and are just ready to open.—*Thornville.*

Frosts, April 2, 5, 11.—*Albion.*

Frosts, April 1, 2, 4, 11, 17, 18, 19, 20, 21, 24, 28. Farmers commenced plowing, about April 12. Ice formed, April 19, 20, 24, 28. No frost in ground April 1. First chipping bird seen April 25. Hail storm, April 8. Snow flurries, April 9. Peach trees in bloom, April 27. Flock of wild geese flying north, April 5, 12. Water elm and soft maple leafing, April 18. American crab apple leafing, April 15. Grass began to grow, April 9. First wild flowers seen, April 20. First appearance of flies and mosquitoes, April 20. Commenced cutting grass on Copitol lawn, April 22. First butterflies, April 22. Horse chestnut trees leafing, April 25. Lilac leafing, April 15. Dandelions in blossom, April 30.—*Lansing.*

Slight frost, April 17.—*Ann Arbor.*

Frosts, April 5, 9, 29.—*Hudson.*

First frogs, April 5. Frosts, April 11, 16, 17, 18, 19, 20, 21, 25, 28, 30. Last ice, April 28, ¼ inch thick. —*Parkville.*

MAY.

Killing frosts, May 3, 11, 17, 22. Light frosts, May 8, 9, 10, 13.—*Marquette.*

Two flocks wild geese flying south, May 3. Geese flying N. W., May 10. Temperature of Gulliver Lake, 44° at 10 A. M., May 13. First barn swallows seen, May 17. Frosts, May 1, 2, 4, 7, 10, 11, 13, 27.—*Gulliver Lake.*

Frost, May 7, 11.—*Alpena.*

Light frosts, May 1, 11, 20.—*Grand Haven.*

Snow at intervals during day, and sufficient to whiten sidewalks in night, May 6.—*Port Austin.*

Killing frost, night of May 11.—*Port Huron.*

Frosts, May 1, 2, 4, 5 6, 7, 8, 11, 17. Peach trees in blossom, May 5; june berry, May 8; plums, May 15; apple trees, May 21; elm leafing, May 18; red oak, May 23; hard maple, May 17; apple trees in blossom, May 21; strawberry, May 26; white oak and locust leafing, May 27. Catbirds first seen, May 4; orioles, May 6; bobolinks and kingbirds, May 18; yellow birds, May 19. May was a very wet month, with very little warm weather. The excessive rainfall hindered work from being done seasonably and everything is late. Wheat has done well under it; all sowed on summer fallow being as good as it can be—stubble ground nothing could help. There is a good promise of all kinds of fruit.—*Thornville.*

Frosts, May 2, 7, 8, 14, 16. Ice formed in nights of May 7, 8, and froze surface of plowed ground. Some vegetables touched with the frost. Killing frost, May 11. Snow flurries, May 6. Pear and cherry trees in bloom, May 8. Ice formed, night of May 10. Chimney swallows first seen, May 13. Some corn planted May 17. Apple trees in bloom, May 19.—*Lansing.*

Frosts, May 6, 7, 11.—*Albion.*

Heavy frosts, May 7, 8, 9, 10. Most migratory birds had arrived, May 3, but disappeared during the cold wave of May 5, 6, reappearing again about the middle of the month.—*Hudson.*

Ice formed, May 2, 8, 11. Frosts, May 14, 16.—*Parkville.*

JUNE.

Temperature, Gulliver Lake, 59°, June 6. Lake only one inch below high water of May 15, 1888. Temperature, Gulliver Lake, 67° at 6 P. M., June 14; 76° at 11:30, June 23. A thermometer laid on black soil rose to 127°; on sand, to 122°, at 11:30 A. M., June 22.—*Gulliver Lake.*

Wheat heading, June 6. Woods in full leaf, June 8. Haying began, June 27. June was a warm, damp month, with a mean temperature of about 30° above the normal. The growth of vegetation was very unusually rapid and all crops—if they do not grow too large—promise well. Among the fruits, the prospect is not so good. The cherries are a failure—apples not so bad.—*Thornville.*

Potato beetles first observed, June 2. Corn and potatoes above the ground about 6 inches, June 3.—*Lansing.*

Light frost, morning, June 8.—*Otsego.*

Light frost, June 8.—*Parkville.*

During the month of June, fruit and forest trees have suffered greatly from blight, which, in many instances, has denuded them of both fruit and leaves.—*Birmingham.*

JULY.

Frost formed on the morning of July 20, doing considerable damage to potatoes and cucumbers.—*Alpena.*

Light frost on low land, July 21. The month has been very dry, corn and potatoes suffering.—*Port Austin.*

Katydids first heard, July 28. Wheat harvest began, July 13. Corn tasseling, July 16. Oat harvest began, July 29. July has been a month of dry sunshiny weather and mostly very hot. It has been unfavorable for growing crops but very favorable for securing the hay and wheat. The drought has been very hurtful to everything, but most on corn and potatoes. The apple crop in this vicinity is going to be very light.—*Thornville.*

The ground is very dry at an extreme depth, July 19.—*Lansing.*

Very light frosts in spots, July 4.—*Otsego.*

The weather conditions for this month have proved very destructive to farm crops; small fruits have proved almost a total failure. The leaves and fruit of apple trees have been blighted to a very ruinous extent; potatoes have also been blighted.—*Birmingham.*

AUGUST.

Light frost in spots, no damage, Aug. 23.—*Gulliver Lake.*

Light frost formed on the morning of Aug. 24; vegetation slightly damaged.—*Alpena.*

First frost of season, Aug. 23; very little damage done beyond nipping tomato vines, celery tops, etc. Temperature was normal on two days; above normal on seven days, and below on twenty-two days.—*Grand Haven.*

Slight frosts, Aug. 23, 24, 31; killed some tender vegetation in low places. August, till the 19th, was a continuation of the July drought; the heavy rains of Aug. 3 and 4 not being sufficient to make a permanent change. After that date it was wet enough. Except a few hot days at the fore part—was cool for the season, the mean being about 5° below the normal. Some wheat has been sowed in August,—more than usual. The reasons that make everyone in a hurry to sow, are, the autumn like character of the weather of the latter part of the month and mainly the fact that wheat for two years has made full growth, going into winter quarters with a small top. Threshing shows that the quality of wheat is excellent, and of oats, very poor.—*Thornville.*

Light frost, no damage, Aug. 23.—*Otsego.*

Frost, first of season, night of Aug. 22.—*Marshall.*

Light frost, Aug. 23. Hot days, 102° in the shade on Aug. 2 and 3.—*Parkville.*

SEPTEMBER.

First frost, light, Sept. 17. First killing frost, Sept. 24, 26, 27, 28.—*Gulliver Lake.*

Frosts, Sept. 14, 24, 29. Heavy frosts, Sept. 25, 28, doing considerable damage to vegetation.—*Alpena.*

Light frosts, Sept. 14, 17. Killing frosts, Sept. 28.—*Grand Haven.*

First frost in immediate vicinity of station occurred during night, Sept. 28.—*Port Huron.*

Light frosts, Sept. 14, 24, 28, 30. Killing frost, Sept. 25. Heavy frost, Sept. 29. The month was rather cool and dry for the season. It was notable for its high barometric pressure and fine weather—very favorable for work. The wheat was sowed unusually early this year, and is likely to make a good top before going into winter quarters. Barn swallows all gone by Sept. 1. Blue birds going about Sept. 15; robins soon after.—*Thornville.*

Killing frosts, in early morning, first of season, Sept. 14. Heavy frosts, Sept. 21, 28, 29. Ice formed, first of season, Sept. 28. Light frosts, 22, 25.—*Lansing.*

Frosts, Sept. 13, 29. Killing frost, Sept. 28.—*Otsego.*

Killing frost, Sept. 28. Light frosts, Sept. 13, 21.—*Albion.*

Frosts, Sept. 14, 17. First killing frost, Sept. 28.—*Parkville.*

OCTOBER.

Geese flying south, Oct. 4. Frost, Sept. 8, 18. Ground first frozen, October 21. First snow, Oct. 30, melted as it fell.—*Gulliver Lake.*

Frosts, Oct. 8, 15, 18, 21, 22, 23, 28, 30. Melting snow on ground, Oct. 28, 29, 30, 31.—*Alpena.*

Heavy frosts, Oct. 21, 22. Melting snow on the ground, Oct. 30. 31. (Snowfall very light).—*Grand Haven.*

Frosts, heavy, Oct. 21; light, Oct. 22. Frosts Oct. 27, 28, 29, 30, 31. First snow flakes seen, Oct. 28. Last black birds seen, Oct. 10; last robins seen, Oct. 22; last blue birds seen, Oct. 23. Wild geese went south, Oct. 21. Fall of leaves: Butternut mostly bare, Oct. 5; maple began to be bare, Oct. 9; elm began to be bare, Oct. 15. The month was notable for its excessive rainfall; almost 8 inches with 15 rainy days—the wettest October ever observed here. The weather was warm till the last week, which was quite wintry, and reduced the average. The conditions were so favorable that wheat made rapid growth and has top enough to winter well. The wet has damaged buckwheat some; much of it not being threshed yet. Other late crops—corn, apples and potatoes, have been secured in pretty good condition, and without much loss.—*Thornville.*

Frost, Oct. 20, 21. First snow, Oct. 28.—*Otsego.*

Frosts, Oct. 15, 17, 19, 20, 21, 22, 30, 31. Thin layer of ice formed, Oct. 21—first of season. Ground froze during night of Oct. 22. Snow flurry—first of season, Oct. 26. Ground frozen hard, Oct. 31.—*Lansing.*

Frosts, light, Oct. 20, 30. Killing, Oct. 21, 22.—*Albion.*

Frosts, Oct. 21, 22, 23, 26, 29.—*Ann Arbor.*

Snow, Oct. 29.—*Parkville.*

NOVEMBER.

Wild geese flying south, Nov. 2; first day average temperature below 32° F., Nov. 4; first ice on Gulliver lake, thin, in spots, Nov. 11; first day maximum temperature below 32°, Nov. 25. Last robins seen, Nov. 25. Gulliver lake open at close of month for the first time in five years.—*Gulliver Lake.*

Frosts, Nov. 5, 11, 12, 13, 14, 15, 16, 19, 20, 27, 28. Melting snow on ground, Nov. 1, 2, 3, 4, 19, 25, 26, 27, 28, 29, 30. Ground frozen about one-half inch, Nov. 30.—*Alpena.*

Melting snow on ground, Nov. 1, 4, 5.—*Grand Haven.*

Inappreciable snow, Nov. 2, 30. Nights that did not freeze, Nov. 7, 8, 9, 11, 14, 17. November was a pleasant month for the season.—*Thornville.*

Killing frosts, Nov. 3, 5, 11, 13, 22.—*Albion.*

Frosts, Nov. 3, 5, 6, 8, 10, 12, 13, 14, 19, 20, 21, 22, 24, 25, 26, 28. Ice formed Nov. 3, 4, 5, 8, 10, 12, 13, 14, 20, 21, 22, 24, 25, 26, 28.—*Lansing.*

Wild geese seen, Nov. 3.—*Parkville.*

DECEMBER.

Gulliver Lake frozen over solid, Dec. 1. Ice 3 inches thick on Gulliver Lake Dec. 9. Three inches of snow on ground, Dec. 15 and 31. Ice on Gulliver Lake 9 inches thick, Nov. 31.—*Gulliver Lake.*

Frost, Dec. 5, 8, 9, 19, 20. Heavy frosts, Dec. 18. Melting snow on ground, Dec. 9, 10, 11, 14, 16, 17, 18, 20, 21, 22, 30, 31. Ground frozen about 4 inches, Dec. 31. Navigation closed, Dec. 8; bay and river frozen over.—*Alpena.*

Melting snow on ground, Dec. 8, 9, 10, 13, 14, 15, 16, 17, 18, 30.—*Grand Haven.*

Melting snow on ground, Dec. 5, 6, 10, 30, 31.—*Port Huron.*

Frosts, except Dec. 30 and 31; more or less ice formed every night. Melting snow on ground, Dec. 20, 21, 31. Ice about 5 inches thick on still water, Dec. 31. December was a fairly pleasant and moderate winter month; there was no sleighing and no mud. The snow that fell on the first 4 days was enough to make good sleighing if it had not drifted; it nearly all went off in the thaw of Dec. 20 and 21. That which came Dec. 27 and 28 the rain of Dec. 31 took off.—*Thornville.*

Frosts, Dec, 3, 4, 5, 6, 7, 8, 9. 11, 13, 14, 15, 16, 22, 24, 25, 26, 27, 28, 30. Grand River frozen over, first time of season, Dec. 3. Ice in Grand River 4 inches thick Dec. 15; 8 inches thick Dec. 31. A little snow on ground in patches, Dec. 15 and 31.—*Lansing.*

Frost, white, Dec. 18, 19. Bees were out, Dec. 21. Winter weather set in, December 1.—*Parkville.*

Depth of snow on ground 2½ inches, Dec. 15: no snow at close of month.—*Tecumseh.*

MEASUREMENTS AND TEMPERATURE OF GROUND WATER.

In a paper entitled "Typhoid Fever and Low Water in Wells," on pages 89-114 of the Report of this board for 1884, it is shown that for the years 1878-82 there was a relation between the sickness and deaths from typhoid fever in Michigan and the depth of water in wells. In the month of October, when the water in wells reached the lowest point in the year, there were the most deaths and sickness from typhoid fever; and following the month of April, when the water in wells was highest, there were the least deaths and sickness from typhoid fever. When this comparison is made in a diagram, it is found that, "beginning with June in each year the curve representing sickness from typhoid fever follows more or less closely the curve representing the average depth of earth above the ground water."

On page 256, of the Report of this Board for the year 1889, is a diagram exhibiting the relation of typhoid fever to low water in wells, in Michigan, for the 10 years, 1878 and 1880-88.

Typhoid fever being one of the most important causes of death in Michigan, it is of very great importance that further evidence be collected on this important subject.

The measurements for each month in 1890, of the depth of a well at each of eight places in Michigan, are shown in Exhibit 8; also the depth of earth above the water, and the temperature of the water in each of the wells. It is hoped that these measurements and observations may continue, and permit a more extended comparison of the depth of water in wells with the sickness from typhoid fever, and with sickness and deaths from other diseases.

CHANGE OF EXPOSURE OF INSTRUMENTS AT LANSING IN 1884.

Comments on the subject of a new instrument shelter at Lansing are printed on page 21, Report for 1885. Exhibits A, B, C, and D, pages 22 and 23, of the report for 1886, relate to that subject, and may be studied in connection with what is said on page 21, Report for 1885. The fact of the change of place of observation in 1884 may need to be taken into account by whoever studies the meteorology at Lansing through a long series of years

EXHIBIT No. 8.—*Depth of Wells; Depth of Ground above Water in Well; Temperature of Water in Well, and day of observation of such temperature, in each month of the year 1890, as reported by Meteorological Observers for the State Board of Health, and for the United State Signal Service.*

Stations in Michigan.	January.			February.			March.			April.			May.			June.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well.—Deg. F.
Traverse City*	55	40	46^{22}	55	39	47^{22}	55	40	46^{25}	55	39 6	47^{22}	55	39 4	49^{31}	55	38 7	48^{22}
Lansing	26 11½	25 8¾	50^{16}	26 11½	25 6⅛	49^{14}	26 11½	25 4⅛	49^{17}	26 11½	25 2	48^{15}	26 11½	24 8⅛	49^{15}	26 11½	24 8⅝	49^{16}
Otsego	23	21 5	51^{23}	23	21 5	$50\ 5^{16}$	23	21 5	41^{15}	23	21 5	47^{15}	23	21 5	47^{16}	23	21 5	$47\ 5^{16}$
Ann Arbor	15	10 7¾	42^{16}	15	9 7¾	41^{16}	15	10 1¼	41^{17}	15	9 11	41^{26}	15	8 4	45^{15}	15	10	48^{14}
Battle Creek	60 8	....	48^{17}	60 8	....	53^{18}	60 8	....	53^{18}	60 8	....	54^{15}	75	....	57^{20}	50	....	48^{15}
Kalamazoo	25	15	48^{15}	25	15	48^{28}	25	15	48^{15}	25	15	48^{15}	25	15	48^{15}	25	15	51^{15}
River Raisin†	23	17	45^{15}	23	17	48^{15}	23	16 6	54^{15}	23	15	47^{15}	23	15 6	47^{15}	23	16	50^{15}
Hillsdale	80 6	23 1	49^{15}	30 6	22 9	50^{15}	30 6	22 8	48^{15}	30 6	21 10	48^{15}	30 6	20 9	48^{15}	30 6	21 9	49^{15}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

* At Northern Michigan Asylum, W. H. Bauld, observer.

† D. W. Palmer, observer.

EXHIBIT 8.—CONTINUED.

Stations in Michigan.	July.			August.			September.			October.			November.			December.		
	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well. —Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well. —Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well. —Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well. —Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well. —Deg. F.	Depth of Well.—Ft., In.	Depth of Ground above Water in Well.—Ft., In.	Temp. of Water in Well. —Deg. F.
Traverse City*	55	40	48^{29}	55	40 4	47^{26}	55	40 2	47^{29}	55	40	48^{27}	55	41 1	48^{24}	55	41	48^{24}
Lansing	26 11½	24 5	49^{16}	26 11½	24 7¼	50^{16}	26 11½	24 11½	51^{15}	26 11½	24 11¾	51^{17}	26 11½	24 9⅜	52^{17}	26 11½	25¼	51^{16}
Otsego	23	21 5	51^{14}	23	21 5	51^{17}	23	21 5	52^{15}	23	21 5	58^{15}	23	21 5	52^{15}	23	21 5	51^{15}_{5}
Ann Arbor	15	10 1½	56^{15}	15	11 1	54^{15}	15	12 2¼	55^{15}_{5}	15	11 9½	54^{15}_{5}	15	11 3¾	51^{15}	15	11 4½	47^{22}_{5}
Battle Creek	60 8	55	58^{20}	60 8	65	58^{15}	60	57	53^{18}	60 8	58 9	50^{20}	60 8	57	58^{18}	60 8	58 9	52^{15}
Kalamazoo	25	15	52^{15}	25	15	53^{15}	25	15	51^{15}	25	15	49^{15}	25	15	50^{15}	25	15	48^{15}
River Raisin†	23	15	58^{16}	23	17	44^{16}	23	16 6	45^{15}	23	17	45^{15}	23	17 6	45^{15}	23	17.	45^{16}
Hillsdale	30 6	22 7	49^{15}	30 6	23 9	50^{15}	30 6	24 6	51^{15}	30 6	24 2	52^{15}	30 6	24 5	50^{15}	30 6	24	50^{15}

NOTE.—The small figures above and at the right of the numbers denoting the degrees of temperature, state the day of the month on which the observation was made.

* At Northern Michigan Asylum, W. H. Bauld, observer.

† D. W. Palmer, observer.

TEMPERATURE OF THE ATMOSPHERE.

Compared with the average for the preceding 26 years at the Agricultural College, the mean temperature for January and February was high. A comparison, by months, of temperature in 1890, with the averages for corresponding months in the preceding 26 years, 1864–89, at the Agricultural College, near Lansing, is given in Exhibit 11, page 21.

The average temperature, by months, for the eleven years, 1879–89, at Lansing, and a comparison of 1890, by months, with that average, are stated in Exhibit 12, page 21.

The average annual and monthly temperature at from 12 to 22 stations for a period of 13 years, 1877–89, is stated in Exhibit 9, page 20, in which is also given, by months, a comparison of 1890 with the average for 1889, and with the averages for the 13 years, 1877–89. By Exhibit 9, page 20, which gives averages for groups of several stations in Michigan, it appears that in 1890 the mean temperature in March, May, August, September and December was lower than in those months in 1889. It also appears that January, February, April, June, July and November were warmer than the average temperature of the corresponding months for the 13 years, 1877–89.

By Exhibit 17, page 31, it appears that, at the Agricultural College, the lowest temperature reached in March, 1890, was considerably below the average lowest temperature for the corresponding month in the preceding 17 years, and that in the month of February, 1890, the range of temperature was considerably less than the average range of temperature for the corresponding month in the 17 preceding years, and also the highest temperature for 1890 was above the average highest temperature for the preceding 17 years, and the lowest temperature was above the average lowest temperature for those years. The highest and lowest temperatures at the Agricultural College, in every month of the 7 years, 1884–90, and comparisons of months in 1890, with the average highest and lowest temperatures by months for the preceding 17 years, are stated in exhibit 17.

The average temperatures at each of 22 stations in Michigan, and the average for 12 stations and for 7 stations in 1890, and in each month of that year, are stated in Table I., page 23; nine of the lines in this table are represented in Diagram I., Page 22.

The average daily range of temperature at from 6 to 18 stations per year, by months, for a period of eleven years, 1879–89, and a comparison of 1890, with the monthly averages for that period and for 1889, are given in Exhibit 14, page 26. The highest and lowest temperatures in every month in 1890, at each of 19 stations, are stated in Table II., pages 24 and 25. The average daily range of temperature by months in 1890, at each of 21 stations, and the average for 19 of the stations, are stated in Table III., page 29. The lines for 10 of these stations, and the average line for the 19 stations, are represented in Diagram II., page 28. It will be noticed that the greatest average daily range occurred during the months of April, July and August.

EXHIBIT 9.—*Average Temperature by Year and Months, in 1890,* compared with Annual and Monthly Averages for 1889, and for the Thirteen Years, 1877-1889. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Average Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89	46.02	20.49	22.92	29.63	44.17	56.28	65.28	70.78	68.03	61.09	49.49	36.32	27.77
Av. 11 years, 1879-89	45.49	20.00	21.54	28.90	43.20	56.24	65.09	70.28	67.55	60.58	49.14	36.03	27.42
1889 (13 stations)	47.36	28.18	18.57	35.83	46.04	56.74	63.05	70.69	68.58	61.36	44.59	37.95	36.76
1890 (12 stations)	46.99	30.06	30.07	27.47	45.23	52.41	69.93	71.29	65.28	58.06	48.88	38.60	26.65
In 1890 Higher than Av. for 13 years, 1877-89	.97	9.57	7.15	------	1.06	------	4.65	.51	------	------	------	2.28	------
In 1890 Lower than Av. for 13 years, 1877-89	------	------	------	2.16	------	3.87	------	------	2.75	3.03	.61	------	1.12
In 1890 Higher than in 1889	------	1.88	11.50	------	------	------	6.88	.60	------	------	4.29	.65	------
In 1890 Lower than in 1889	.37	------	------	8.36	.81	4.33	------	------	3.30	3.30	------	------	10.11

NOTE.—The stations represented in the lines for average temperature for the years 1877-89 in Exhibit 9 are the following: Thornville, Kalamazoo for 1887-89; Mendon for 1877-82; Tecumseh for 1877-85, 1888, 1889; Detroit for 1877-87; Battle Creek for 1877-80, 1882, 1885, 1888, 1889; Nirvana for 1877-79 and first four months of 1880; Reed City for last eight months of 1880 and 1881-85; Coldwater, Ypsilanti, Woodmere Cemetery (near Detroit), for 1877-79; Otisville for 1878-80, 1882; Niles for 1878-80, 1881; Marquette for 1879-84, 1886-87; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-89; Washington for 1879-83; Benton Harbor for 1877-78; Agricultural College for 1877, 1881-89; Petoskey for 1878-79; Escanaba for 1880-87; Harrisville for 1881-82, 1885-6; Ann Arbor for 1881-89; Parkville for 1881-82; Traverse City, Marshall for 1882-89; Hillsdale for 1882-84; Winfield for 1881, 1883; Hudson and Mallory Lake for 1881; Ionia for 1883-85; Manistique, Swartz Creek for 1884-85; Mackinaw City for 1884-87; Port Austin for 1885, 1888, 1889; Muskegon, Pentwater for 1886; Gulliver Lake, Birmingham, Otsego for 1887-89.

* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 9, because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

EXHIBIT 10.—*By Year and Months in 1890, the Average Atmospheric Temperature, as indicated by: (1) Tri-daily observations, at 7 A. M., 2 P. M. and 9 P. M.; (2) by Bi-daily observations, at 8 A. M. and 8 P. M.; and (3) by self-registering Maximum and Minimum thermometers. These Averages are for Groups of Stations in Michigan.*

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. of tri-daily observations* at 7 A. M., 2 P. M. and 9 P. M.	46.99	30.06	30.07	27.47	45.23	52.41	69.93	71.29	65.28	58.06	48.88	38.60	26.65
Av. of bi-daily observations at 8 A. M. and 8 P. M.†	44.87	28.09	27.96	25.52	42.21	48.99	66.68	68.11	63.25	56.50	47.50	37.53	26.14
Av. of daily Max. and Min.‡	46.00	28.76	28.91	26.45	43.88	50.86	69.19	69.35	64.09	57.78	48.61	38.35	25.76

* At 12 stations.
† At 7 stations.
‡ At 16 stations.

EXHIBIT 11.—*Comparison of the Average Temperature during the Year and during each month of the Year 1890, with the Annual and with the Monthly Averages for the Year 1889, and with the Averages for the 26 Years, 1864-89. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 26 years, 1864-89.	46.44	21.53	23.49	31.02	45.68	58.13	67.51	71.54	68.71	60.28	48.07	35.51	26.03
1889	47.33	28.04	18.25	36.51	46.59	57.37	62.83	70.19	68.56	61.24	44.19	37.39	36.75
1890	47.60	31.54	31.54	28.15	47.08	53.69	70.40	71.04	65.42	57.76	49.11	39.06	26.45
In 1890 Higher than Av. for 26 years, 1864-89	1.16	10.01	8.05	......	1.40	......	2.89	......	......	......	1.04	3.55	.42
In 1890 Lower than Av. for 26 years, 1864-89	......	......	......	2.87	......	4.44	......	.50	3.29	2.52	......	......	......
In 1890 Higher than in 1889	.27	3.50	13.29	......	.49	......	7.57	.85	......	......	4.92	1.67	......
In 1890 Lower than in 1889	......	......	......	8.36	......	3.68	......	......	3.14	3.45	......	......	10.30

EXHIBIT 12.—*Average Temperature.* by Year and Months, for the 11 Years, 1879-89. Observations made at Office State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Average Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1879-89.	47.16	21.13	23.35	31.21	45.94	58.77	67.34	72.49	68.95	61.56	50.21	37.01	27.99
1889	47.65	29.00	18.89	36.81	46.91	56.99	63.36	70.59	68.46	61.32	44.39	37.71	37.31
1890	47.89	31.63	31.51	28.53	46.86	53.94	71.03	71.81	65.38	57.97	49.09	39.46	27.46
In 1890 Higher than Av. for 11 years, 1879-89	.73	10.50	8.16	......	.92	......	3.69	......	......	......	......	2.45	......
In 1890 Lower than Av. for 11 years, 1879-89	......	......	......	2.68	......	4.83	......	.68	3.57	3.59	1.12	......	.53
In 1890 Higher than in 1889	.24	2.63	12.62	......	......	......	7.67	1.22	......	......	4.70	1.75	......
In 1890 Lower than in 1889	......	......	....	8.28	.05	3.05	......	......	3.08	3.35	......	......	9.85

* Beginning with the year 1885, slight allowance should be made for Lansing in Exhibit 11, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

DIAGRAM I.—AVERAGE TEMPERATURE, BY MONTHS, 1890.

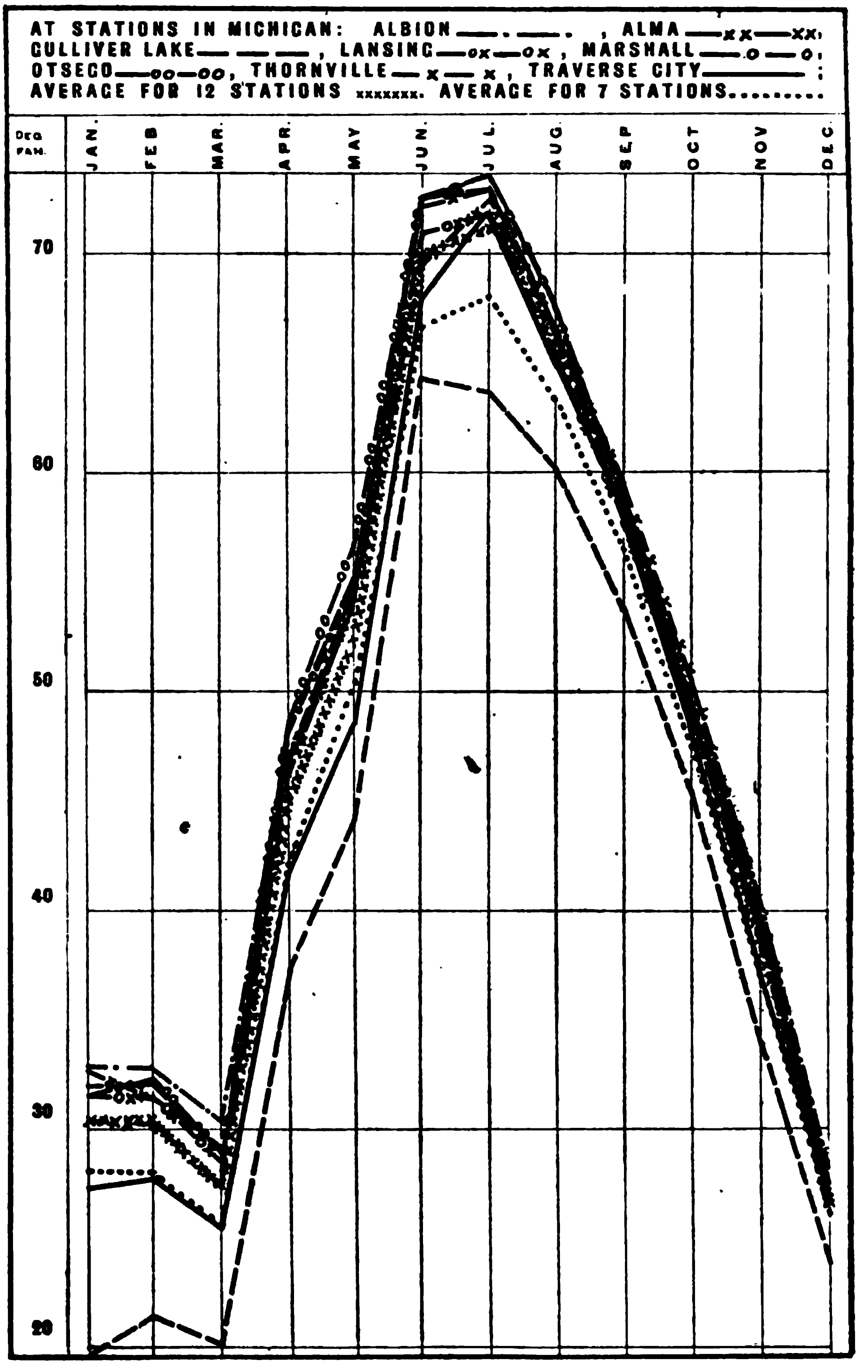

TABLE I.—*Average temperature in Degrees Fahr., for the Year, and for each Month of the Year 1890, at each of 19 Stations in Michigan, and also Average lines for 12 Stations and for 7 Stations. From Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Temperature in Degrees Fahr.													
		Year.		Months,** 1890.											
		Norm. ¶	1890.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 stations §	....	......	46.99	30.06	30.07	27.47	45.23	52.41	69.93	71.29	65.28	58.06	48.88	38.60	26.65
Av. for 7 stations ‖	....	......	44.87	28.09	27.96	25.52	42.21	48.99	66.68	68.11	63.25	56.50	47.50	37.53	26.14
Marquette	U. P.	......	40.21	18.51	20.59	20.12	38.83	42.00	62.80	65.05	60.06	53.70	44.80	33.30	23.25
Gulliver Lake	U. P.	40.05[4]	40.63	19.58	21.50	20.11	37.33	44.06	64.29	63.69	60.14	53.67	45.46	33.86	23.86
Manistee	N. W.	......	44.37	27.71	27.46	25.13	39.66	47.80	65.80	66.80	62.70	56.00	47.15	38.00	28.20
Traverse City	N. W.	43.24[8]	45.54	27.33	27.69	25.47	41.81	48.49	68.02	71.90	64.82	58.32	48.14	37.40	27.12
Alpena	N. E.	......	41.79	24.27	23.95	21.14	37.98	45.70	63.57	65.70	61.25	54.68	45.25	34.45	23.55
Harrisville	N. E.	43.19[2]	42.83	25.59	25,75	23.77	38.59	45.24	62.80	66.75	62.29	56.59	46.92	35.28	24.34
Grand Haven	W.	......	46.27	30.35	30.13	27.06	44.25	49.90	67.95	68.15	63.60	57.00	47.90	40.15	28.80
Port Austin	B. & E.	......	‡‡	30.59	[d] 29.56	28.05	[c] 42.77	[g] 50.17	[g] 66.46	[f] 70.25	[i] 67.17	.....	.....	.....	.....
Port Huron	B. & E.	......	45.71	31.20	29.48	27.10	41.80	50.15	66.55	69.00	63.95	57.85	48.45	37.80	25.15
Thornville	B. & E.	47.75[14]	48.56	32.68	31.54	28.86	46.62	54.67	72.35	73.06	66.28	59.27	50.44	39.92	27.05
Alma	C.	. ....	47.39	30.89	30.24	27.39	46.11	54.18	[h] 69.32	72.47	[a] 66.06	[b] 58.14	48.87	38.62	[j] 26.91
Agricultural College	C.	46.48[27]	47.60	31.54	31.54	28.15	47.08	53.69	70.40	71.04	65.42	57.76	49.11	39.06	26.45
Lansing S. B. of H. ††	C.	47.22[12]	47.89	31.63	31.51	28.53	46.86	53.94	71.08	71.81	65.88	57.97	49.09	39.46	27.46
Otsego	S. W.	47.34[4]	48.77	31.49	32.30	28.78	48.70	56.61	72.56	73.01	66.45	58.76	49.56	39.41	27.58
Albion	S. C.	......	49.22	32.90	32.87	30.30	48.17	55.20	72.50	73.62	[a] 67.37	58.60	50.35	40.50	28.20
Ann Arbor	S. C.	46.45[10]	48.34	32.40	31.70	29.20	46.50	54.00	71.90	[a] 72.40	66.50	60.00	49.10	39.72	26.66
Battle Creek	S. C.	......	¶¶	32.71	30.52	28.35	51.70	61.02	75.89	76.57	[a] 71.68	.....	55.28	43.83	30.01
Kalamazoo	S. C.	. ....	48.07	31.77	32.39	28.82	47.60	53.97	70.73	71.45	65.82	57.95	49.08	39.60	27.65
Marshall	S. C.	45.79[8]	48.66	32.05	32.15	29.12	48.19	54.85	72.57	73.65	67.57	58,50	48.86	39.62	26.81
Tecumseh	S. C.	47.26[3]	49.44	33.14	32.58	[k] 27.43	48.62	56 45	73.58	72.89	67.59	59.61	[i] 54.11	[e] 40.63	27.19
Birmingham	S. E.	46.94[4]	48.51	[a] 33.14	[d] 32.10	30.01	46.80	[b] 54.06	[c] 71.43	[a] 72.12	[f] 65.05	[b] 59.15	[a] 50.68	40.34	27.82
Detroit	S. E.	......	47.69	32.79	31.70	29.25	45.33	53.40	69.85	70.60	65.35	58.35	49.85	38.40	26.35

a, b, c. In the columns from January to December, inclusive, the letters a, b. c. etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g for 24 days. h For 22 days. l for 21 days. j For 19 days. k for 18 days.

* At the U. S. Signal Service Stations during the year 1890, the observations were made at 8 A. M. and 8 P. M., 75th meridian time, and one-half the sum of the two observations was taken as the daily average. The local time at these stations corresponding to 8 A. M. and 8 P. M., 75th meridian time, is as follows: At Port Huron, 7:30 A. M. and 7:30 P. M.; at Detroit, 7:28 A. M. and 7:28 P. M.; at Alpena, 7:26 A. M. and 7:26 P. M.; at Grand Haven, 7:15 A. M. and 7:15 P. M.; at Marquette, 7:11 A. M. and 7:11 P. M.; at Manistee, 7:15 A. M. and 7:15 p. m. At the other stations the observations were made at 7 A. M., 2 P. M. and 9 P. M., local time, and the daily averages were one-third the sum of these three observations.

[The remaining foot-notes are on page 25.]

The lines for 8 representative stations in Table I. are graphically represented in Diagram I., page 22.

TABLE II.—*Extremes of Temperature and Days of Month on which the Highest and Range for the Year 1890, at each of 19 Stations in Michigan.—As indicated by Daily 2 P. M. and 9 P. M., by Observers* for the State Board of Health, and for the U. S.*

Line Number.	Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Year, 1890.			January.		February.		March.		April.		May.	
		Highest.	Lowest.	Range.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1	At 19 Stations†	100	-26	126	66	-14	63	-8	59	-26	80	1	91	21
2	*Marquette*§	91	-12	103	46 28	-6 22	45 4	0 20	40 12	-12 6	69 22	14 1	78 29	24 1
3	Gulliver Lake‖	90	-26	116	41 29	-14 17, 18	41 24	-4 28	46 12	-26 4	59 22	1 1	76 31	31 1, 1
4	*Manistee*§	91	-7	98	44 1	2 22	52 4	10 21	46 20	-7 7	72 22	20 1	78 29	30 1
5	Traverse City‡	98	-20	118	50 29	1 21	51 4	6 21	53 20	-20 6	80 22	18 1	91 29	26 10
6	*Alpena*§	89	-13	102	51 2	2 21, 22	49 4	6 21	44 13, 25	-13 6, 7	75 12	13 1	78 31	26 2
7	Harrisville‡	92	-14	106	51 1	-1 21	50 4	-8 28	49 25	-14 6	77 12	21 1, 10	73 25	27 1, 5, 7, 15
8	*Grand Haven*§	90	-4	94	61 12	5 21, 22	51 4	13 20, 21	51 20	-4 6	70 22	22 1	78 29	28 1
9	Port Austin‡	....	....	....	56 12	13 22, 25	54 4	12 20	55 25	0 6	78 12	25 1	86 31	34 6, 7
10	*Port Huron*§	95	2	93	64 11	4 22	60 4	11 21, 22	54 25	2 5	72 13, 22	22 1	76 29	34 1, 11
11	Thornville‡	98	-2	100	63 11	4 22	61 4	11 21	52 11	-2 6	77 12	20 1	83 30	32 7
12	Alma**	....	....	....	53 1, 11	1 21, 22	51 17	7 9	52 22	-8 6	79 22	23 19	88 30	28 7
13	Agr'l College‡	97	-4	101	63 11	3 21. 22	61 4	12 20, 28	52 25	-4 5, 6	76 12	20 1	83 30	28 10
14	Lansing, S. B. of H. ‡a	95	-4	99	63 11	0 21, 22	61 4	10 21	56 13	-4 5	75 12	21 18	84 30	29 6, 10
15	Otsego††	99	-4	103	62 12	1 21	62 4	8 28	59 21	-4 5	77 13, 22	23 16	88 29	27 10
16	Albion‡	95	2	93	60 12	4 21	61 4	14 20	54 21	2 5	72 12, 22	25 1	88 30	32 10
17	Ann Arbor¶	93	1	92	63 11	2 22	61 4, 5	10 21	53 25	1 6	73 12	22 1	82 30	33 7
18	Battle Creek‡	....	....	....	63 12	0 22	61 4	10 8, 21	50 20, 21	-6 6	70 8, 13	27 1, 2	85 30	36 6
19	Kalamazoo§	100	0	100	62 11	6 22	62 4	11 8	55 21	0 6	75 22	23 1	85 30	35 11
20	Marshall ‡‡	99	-2	101	62 11	1 22	62 4	12 21	55 21	-2 6	77 22	18 1	87 29, 30	29 8, 11
21	Tecumseh §§	100	0	100	66 11	2 22	63 4	12 21	57 11	0 6	80 22	21 1, 2	89 31	28 11
22	Birmingham‡	96	3	93	59 12	3 21	61 4	11 20	55 25	3 5, 6	75 12, 13, 22	21 1	83 29, 30, 31	32 6
23	*Detroit*§	96	4	92	66 11	5 22	63 4	12 21	57 21	[illegible] 6	74 8	25 1	84 30	32 7

NOTE.—The small figures above and at the right of numbers denoting the degrees of temperature, state the day or days of the month on which the highest or the lowest temperature occurred.

*** The names of observers, etc., are stated in Exhibit 1, page 2.**

† The line No. 1, and the three columns for the year 1890, relate only to the 19 stations from which observations were received for every month of the year. It does not include Alma, Port Austin and Battle Creek.

‡ For stations marked thus‡, the daily readings of registering thermometers were recorded at 7 A. M. for the preceding calendar day.

§ At the stations of the U. S. Signal Service and at Kalamazoo, the maximum thermometer was read and recorded at the morning observation, and the minimum at the evening observation.

¶ At Ann Arbor the registering thermometers were read and recorded at 9 P. M.

‖ At Gulliver Lake the regeestering thermometers were read at 9 P. M. for April, May and August; at P. M. for July.

**** At Alma the registering thermometers were read at 9 P. M. for June, September and October.**

†† At Otsego the registering thermometers were read at 7 P. M. for July.

‡‡ At Marshall the registering thermometers were read at 9 P. M. for April.

§§ At Tecumseh the registering thermometers were read at 3 P. M. for March and April.

a Beginning with the year 1885 allowance must be made for Lansing in Table II, because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit B, on page 22, Report for 1886.

the Lowest Temperature occurred by Months of the year 1890; also, Extremes and Readings of Registering Thermometers, or by Observations made daily at 7 A. M., Signal Service.

June.		July.		August.		September.		October.		November.		December.		
Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Line Number.
98	33	98	39	100	34	90	27	80	24	68	0	50	-6	1
27 89	5 40	28 91	9, 19 46	7 84	23 39	1 81	13, 28 34	7 70	29 28	5, 16, 24 50	30 19	22 48	3 3	2
28, 29 90	7 42	14 84	19 43	3, 7 80	23 35	6 78	28 27	1 70	21, 22 24	5 50	4, 23, 27 19	22 41	7 1	3
25, 27 84	8 44	7 89	10 48	2 91	23 40	6 84	28, 29 34	4 67	21 31	5, 14 53	30 26	20, 22 45	8, 26 8	4
27 98	7 41	7 97	9 45	2 92	22, 24 38	6 87	27 28	2 74	20,22,29 27	5 57	30 15	22 48	25 -6	5
28 89	8 38	7, 29 88	21 44	3 81	24 40	7 89	28 32	3 68	30 28	5 57	30 0	22 47	8 1	6
24 90	7 32	7 92	20 39	3 86	23 36	2, 6, 7 82	28 30	3 70	29 26	5 58	30 19	22 46	7 -2	7
29 89	8 43	7 86	5 48	2 90	23 42	6 83	26 34	13 78	22,24,30 32	7 56	28, 30 27	20 48	8 6	8
28 93	7 44	29 95	20 49	2 90	24 40									9
28 94	8 40	8 96	10 47	3 93	24 44	7 87	25,28,29 40	2, 3 73	30 27	9 63	28 23	21 47	3 5	10
29 91	8 42	30 94	10, 21 48	3 98	31 42	7 90	29 35	2 75	30 29	9 65	27 21	22 48	29 8	11
	8 39	12 91	5 46	3 92	31 39	8 86	25,28,29 32	9 74	30 27	5, 6 62	3 24	16, 23 49	8 1	12
28 93	7 39	30 92	4 44	3 97	29 34	7 90	27 29	13 76	29 25	5 62	27 20	22 47	5 7	13
28 92	7 39	7, 30 92	4 43	3 95	22 39	7 89	27 30	18 76	29, 30 26	5 62	27 20	22 47	27 9	14
25 96	7, 8 36	7 98	4 43	2, 3 99	22 35	3, 6, 7 90	27 30	13 80	20, 21 28	5 64	27, 28 20	22 48	7 9	15
28, 29 92	7 43	30 90	4 49	3 95	22 44	7 85	28 37	13 76	29 31	7 62	27 23	22 46	27 11	16
28 92	8 42	8 91	5 50	3 93	23 43	7 84	28 36	13 74	30 28	7 64	28 18	22 46	3, 28 9	17
26 95	8 51	31 93	21 60					2 75	29 37	9 60	28 28	15, 23 47	1,25,26,27 18	18
29 93	7, 8 50	30 94	5 52	3 100	23 43	7 87	28 37	13 76	30 33	6 65	28 26	22 50	8 13	19
25, 29 97	8 39	7, 31 96	5 43	3 99	23 40	6 88	28 31	13 77	30 28	5 63	28 19	22 46	6 6	20
24, 29 97	8 36	9 97	5, 10, 21 46	4 100	23 41	6, 8 89	21, 28 33	4 74	22 30	7 68	28 18	22 48	7 4	21
25 92	7 40	8, 29, 30 94	9 43	3 96	31 42	7 86	13 34	4 74	29 27	7 65	28 12	21 49	29 5	22
28 94	8 45	8 96	10, 20 52	3 92	23 46	7 85	29 39	3 74	30 29	7 66	28 21	21 48	28 10	23

[Foot-notes from page 23.]

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

§ This line is an average for only the 12 stations at which observations were made tri-daily, and from which statements nearly complete were received for every month of the year. It does not include the U. S. Signal Service Stations, Port Austin, Battle Creek, Tecumseh and Kalamazoo.

‖ This line is an average for the 6 U. S. Signal Service Stations and Kalamazoo.

¶ Numbers in this column state the average annual temperature for periods of years ending in each case with December 31, 1890. The small figures above and at the right of numbers which state the temperature, denote the number of years included in the average.

** The computations of Av. Temp., as tabulated for months in 1890, were made at the following stations: Marquette, Manistee, Grand Haven, Detroit, Ann Arbor, Alpena, Port Huron, Albion. All other computations in Table I. were made at the office of the State Board of Health.

†† Beginning with the year 1885, allowance must be made for Lansing in Table I., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit A, on page 22, Report for 1886.

‡ The names of divisions, and the counties in each, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

‡‡ The average for 8 months is 48.13.

¶¶ For 11 months, 50.68

EXHIBIT 13.—*Average Temperature, by Year and Months, for the 3 Years, 1888-90, at Office State Board of Health, State Capitol, Lansing, Michigan. Computed from readings at 7 A. M., 2 P. M. and 9 P. M., daily, from registers of the Draper Self-Recording Thermometer, placed in the shelter for meteorological instruments, southwest corner Capitol yard.*

Years, etc.	Average Temperature.—Draper's Self-Recording Thermometer.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 2 years, 1889-90	46.97	30.62	26.75	32.56	46.32	53.89	65.09	68.65	64.78	58.73	45.68	38.41	32.17
1888	*	......	......	28.39	44.06	58.32	66.96	68.96	66.25	56.88	46.09	39.38	31.65
1889	47.10	29.41	21.09	36.95	46.07	56.13	61.94	68.19	66.61	59.72	44.16	37.84	37.05
1890	46.84	31.82	32.40	28.16	46.57	51.65	68.23	69.10	62.95	57.74	47.20	38.97	27.29

* The average for 10 months, is 50.19.

EXHIBIT 14.—*Average Daily Range of Temperature, by Year and Months in 1890, compared with Annual and Monthly Averages for 1889, and for the 11 years, 1879-1889. These Averages are for Groups of Several Stations in Michigan.**

Years, etc.	Average Daily Range of Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 11 years, 1879-89*	18.15	16.17	17.99	17.88	19.30	20.59	20.43	20.71	20.11	19.87	17.23	14.33	13.19
1889 (16 Stations)	17.46	13.93	17.32	16.74	18.74	19.28	18.00	21.20	21.50	20.59	16.98	11.81	13.41
1890 (19 Stations)	17.38	15.22	13.99	15.92	20.68	18.00	19.96	21.37	20.06	19.67	14.67	14.72	14.33
In 1890 Greater than Av. for 11 years, 1879-89	......	......	......	......	1.38	......	......	.66	......	......	......	.39	1.14
In 1890 Less than Av. for 11 years, 1879-89	.77	.95	4.00	1.96	......	2.59	.47	......	.05	.20	2.56	......	......
In 1890 Greater than in 1889	......	1.29	......	......	1.94	......	1.96	.17	......	......	......	2.91	.92
In 1890 Less than in 1889	.08	......	3.33	.82	......	1.28	......	......	1.44	.92	2.31	......	......

* Marquette for 1879-84, 1886-89; Grand Haven for 1879-88; Lansing, Detroit for 1879-89; Otisville for 1879-80, 1882; Battle Creek for 1879-80, 1888-89; Escanaba for 1880-87; Alpena, Port Huron, Thornville for 1880-89; Kalamazoo for 1880-83, 1886-89; Adrian for 1880; Agricultural College for 1881-89; Traverse City, Marshall for 1882-89; Harrisville for 1882, 1885-89; Reed City for 1882, 1884-85; Ann Arbor for 1882-3, 1885-89; Washington for 1882-83; Winfield for 1883; Tecumseh for 1883-85; Manistique, Ionia, Swartz Creek for 1884-85; Mackinaw City for 1884-87; Hillsdale for 1884; Pentwater, East Saginaw, Hudson for 1886; Birmingham for 1887, 1889; Gulliver Lake for 1887-89; Port Austin for 1888-89; Manistee for 1889.

EXHIBIT 15.—*Comparisons of the Average Daily Range of Temperature for the Year and for each Month of the Year 1890, with Averages for the 16 Years, 1874-89, and for the Year 1889. Observations made with Registering Thermometers by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Daily Range of Temperature—Degrees Fahr.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 16 years, 1874-89*	20.98	16.92	19.27	19.32	22.42	24.22	22.92	24.88	25.58	24.30	20.35	16.00	14.96
1889	20.88	15.19	21.28	20.65	21.50	20.45	18.37	22.93	26.65	27.20	23.07	12.60	14.61
1890	19.78	15.64	13.90	16.74	23.87	19.84	21.80	24.32	25.40	24.73	18.14	17.07	15.29
In 1890 Greater than Av. for 16 years, 1874-89	......	......	......	......	1.45	......	......	......	......	.43	......	1.07	.33
In 1890 Less than Av. for 16 years, 1874-89	1.20	1.28	5.37	2.58	......	4.38	1.12	.56	.18	......	2.21	......	......
In 1890 Greater than in 1889	......	.45	......	......	2.37	......	3.43	1.39	......	......	......	4.47	.68
In 1890 Less than in 1889	.65	......	7.38	3.91	......	.61	......	......	1.25	2.47	4.93	......	......

* For the years 1874-6, 1878, 1879 (except Nov. and Dec.), and 1880, the computations were made from the report of observations published in the Reports of the State Board of Agriculture for those years. For 1877, 1881 (except Jan.), 1882-89, the computations were made from registers or copies of registers supplied by Dr. Kedzie.

DIAGRAM II.—AV. DAILY RANGE OF TEMP., BY MONTHS, 1890.

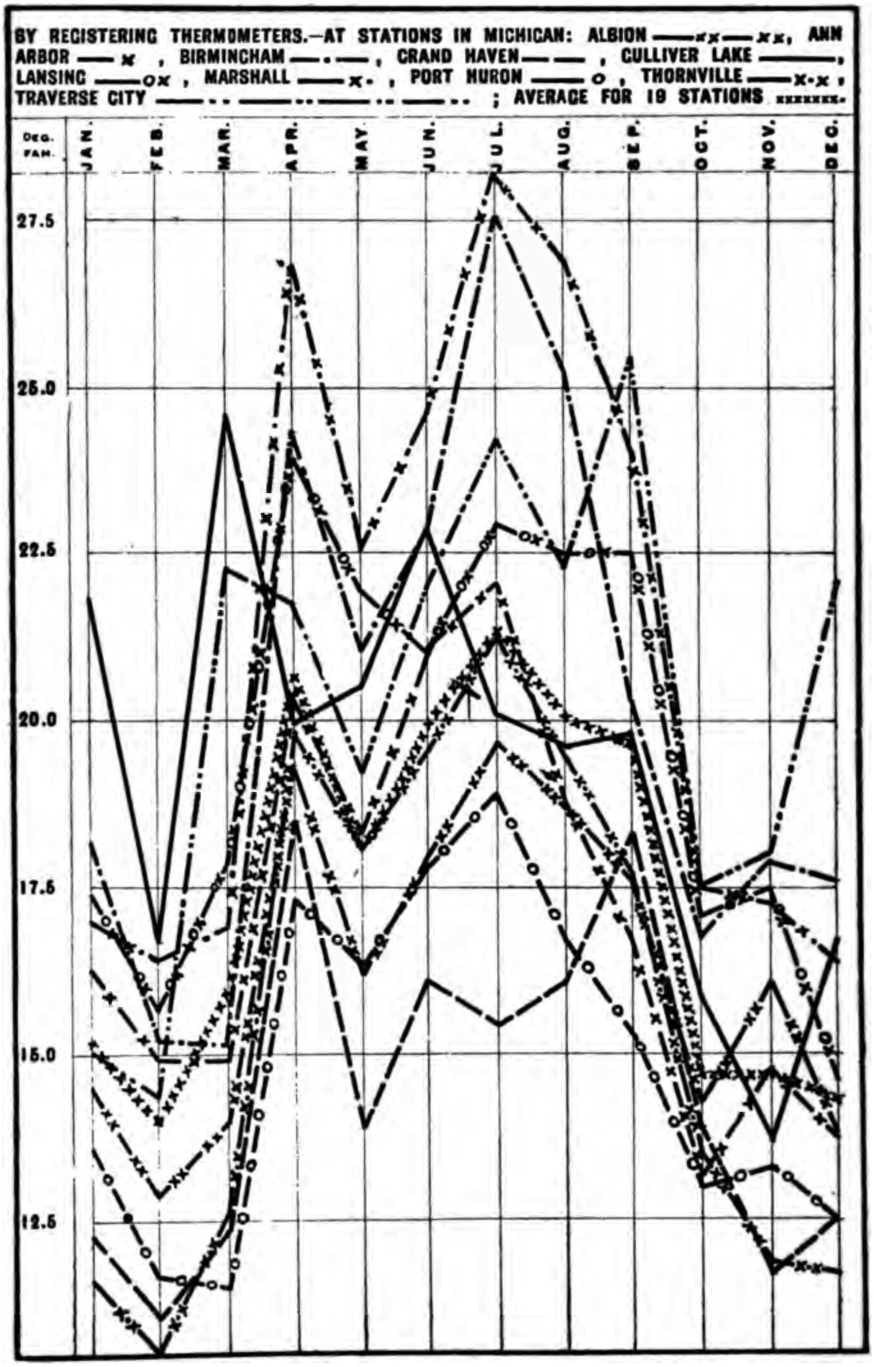

TABLE III.—*Average Daily Range of Temperature, by Registering Thermometers during the Year and during each Month of the Year 1890, at each of 19 Stations in Michigan, and Average for 19 Stations.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Norm. ‡	Average Daily Range of Temperature.—Degrees Fahr.												
			Yr. 1890.	Months, 1890.											
				Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 19 Stations §	....	......	17.38	15.22	13.99	15.92	20.68	18.00	19.96	21.37	20.06	19.67	14.67	14.72	14.33
Marquette	U. P.	15.77^{5}	14.03	11.80	13.40	12.60	16.40	14.10	18.10	17.50	13.50	16.50	11.30	11.00	12.20
Gulliver Lake	U. P.	20.05^{4}	19.36	21.84	16.63	24.58	19.93	20.52	22.87	20.10	19.58	19.88	15.90	13.78	16.74
Manistee	N. W.	12.57^{2}	12.26	7.90	8.90	11.50	15.10	12.40	15.90	13.90	14.10	16.20	10.90	9.40	10.90
Traverse City	N. W.	19.59^{9}	20.36	15.06	14.86	22.32	21.77	19.23	22.07	24.19	22.29	25.47	17.48	18.00	[a] 22.10
Alpena	N. E.	15.78^{11}	13.46	12.40	13.20	14.70	16.10	14.50	16.00	16.40	14.50	15.20	9.20	9.00	10.30
Harrisville	N. E.	20.97^{6}	18.11	16.87	16.07	17.84	19.40	16.90	20.00	21.54	20.10	20.20	14.84	16.74	16.48
Grand Haven	W.	......	14.35	12.30	11.10	12.40	18.50	13.90	16.10	15.40	16.10	18.30	13.90	11.70	12.50
Port Austin	B. & E.	......	‖	12.00	[b] 11.37	13.90	18.07	[a] 18.33	17.40	[a] 16.87	[c] 16.86	.....	.....	.....	.....
Port Huron	B. & E.	15.87^{11}	14.83	13.60	11.70	11.50	17.30	16.30	17.80	18.90	16.70	15.30	13.00	13.30	12.50
Thornville	B. & E.	16.46^{11}	15.64	11.65	10.50	12.68	19.80	18.06	19.58	21.26	19.42	17.70	13.48	11.90	11.71
Alma	C.	......	19.68	16.00	[d] 17.84	19.58	25.23	21.06	[c] 19.05	24.25	21.90	22.18	16.19	16.40	16.49
Agricultural College	C.	20.19^{9}	19.78	15.64	18.90	16.74	23.87	19.84	21.80	24.32	25.40	24.73	18.14	17.07	15.29
Lansing, S. B. of H.	C.	19.48^{12}	19.38	17.42	15.65	17.84	23.90	21.96	21.00	22.97	22.52	22.58	17.06	17.53	14.61
Otsego	S. W.	......	21.99	19.96	15.85	19.61	25.87	21.68	25.27	29.16	27.71	26.53	18.87	18.00	15.84
Albion	S. C.	......	16.26	14.50	12.90	14.09	19.30	16.20	18.00	19.72	18.70	17.60	14.26	16.10	13.80
Ann Arbor	S. C.	18.01^{9}	17.10	[a] 16.30	14.90	14.90	20.30	18.30	21.10	22.10	18.76	16.73	13.20	14.80	13.75
Kalamazoo	S. C.	17.26^{5}	16.97	16.65	15.00	15.30	20.30	16.90	18.20	19.87	20.34	18.77	14.00	16.17	12.13
Marshall	S. C.	19.75^{9}	21.23	17.00	16.43	16.94	26.80	22.58	24.63	28.29	26.90	24.03	17.55	17.24	16.88
Tecumseh	S. C.	.....	¶	16.46	15.75	[e] 17.89	26.60	23.06	26.03	27.97	25.84	22.67	[c] 19.55	.....	.....
Birmingham	S. E.	22.29^{4}	20.18	18.23	15.25	15.16	24.30	21.06	22.87	27.55	25.26	20.27	16.74	17.87	17.62
Detroit	S. E.	15.74^{12}	15.18	14.00	12.10	12.30	19.20	16.60	18.90	18.40	17.30	15.80	12.80	13.80	11.00

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* The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

† For counties in each division see Exhibit I, in a paper which follows on weekly reports of sickness.

‡ Numbers in this column state the annual average range of temperature for periods of years ending in each case with December 31, 1890. The small figures above and at the right of numbers which state the range of temperature, denote the number of years included in the average.

§ This line is an average for all stations for which statements nearly complete are given for every month of the year. It does not include the lines for Port Austin and Tecumseh.

‖ The average for 8 months is 15.60. ¶ For 10 months, 22.18.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 27 days. c For 22 days. d For 19 days. e For 18 days.

NOTE.—Graphic representations of statements in Table III., are given in Diagram II, page 28.

EXHIBIT 16.—*Comparisons of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year, and during each Month of the Year 1890, with the Average of the Extremes, and of the Range, for the Thirteen Years, 1877-89; also, Statement of the Extremes and of the Range for each of the Six Years, 1884-89. Observations made with Registering Thermometers by Observers for the State Board of Health, and for the U. S. Signal Service. These Comparisons, etc., are for* **Groups of Several Stations in Michigan.**

Year and Months.	Extremes and Ranges of Temperature.—Degrees F.																										
	1884.			1885.			1886.			1887.			1888.			1889.			Av. for 13 years, 1877-89.			1890.*			1890 Higher (+), or lower (-), than Av. 13 years, 1877-89.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	105	-33	138	96	-36	132	101	-30	131	104	-28	132	99	-33	132	97	-23	120	99	-27	126	100	-26	126	+1	+1	0
Av. Month.	81	7	74	75	7	69	79	4	75	79	10	69	76	9	67	77	14	63	79	10	68	79	10	68	0	0	0
January	52	-33	85	53	-36	89	55	-22	77	54	-28	82	45	-23	68	53	-7	60	53	-21	75	66	-14	80	+13	+7	+5
February	64	-31	95	50	-33	83	54	-30	84	55	-21	76	49	-33	82	49	-23	72	56	-21	77	63	-8	71	+7	+13	-6
March	65	-27	92	55	-29	84	73	-25	98	60	-14	74	69	-20	89	65	5	60	66	-14	79	59	-26	85	-7	-12	+6
April	80	17	63	84	6	78	84	0	84	82	8	74	88	6	82	80	14	66	83	8	75	80	1	79	-3	-7	-4
May	84	27	57	87	18	69	88	22	66	97	28	69	84	21	63	95	23	72	89	22	67	91	21	70	+2	-1	+3
June	95	37	58	93	32	61	95	27	68	98	40	58	99	29	70	93	36	57	95	32	62	98	32	66	+3	0	+4
July	93	37	56	96	39	57	101	33	68	104	39	65	97	40	57	97	36	61	98	40	58	98	39	59	0	-1	+1
August	102	34	68	90	35	55	98	32	66	98	37	61	94	33	61	94	37	57	96	37	59	100	34	66	+4	-3	+7
September	105	30	75	88	25	63	91	27	64	91	26	65	90	28	62	93	25	68	94	29	65	90	27	63	-4	-2	-2
October	96	20	76	81	13	68	83	16	67	80	11	69	73	23	50	76	14	62	84	19	65	80	24	56	-4	+5	-9
November	75	-6	81	68	19	49	72	-15	87	70	-6	76	72	8	64	66	11	55	70	1	69	68	0	68	-2	-1	-1
December	60	-27	87	55	-11	66	53	-22	75	56	-6	62	55	1	54	65	2	63	58	-9	67	50	-6	56	-8	+3	-11

☞* **For the fourteen years, 1877-90, the highest temperature was 105°, at Battle Creek, September 9, 1884; the lowest was -36°, at Manistique, January 27, 1885.**

EXHIBIT 17.—*Comparisons of the Extremes and the Range of Temperature (Degrees Fahr.) during the Year, and during each month of the Year 1890, with the Average of the Extremes and of the Range, for the 17 Years, 1873-89; also Statement of the Extremes and of the Range for each of the six Years, 1884-89. Observations made with Registering Thermometers (except for the first two months of 1873, and for those two months with an ordinary Thermometer, at 7 A. M., 2 P. M. and 9 P. M.) Daily by Prof. R. C. Kedzie,* **at the State Agricultural College, near Lansing, Mich.**

Year and Months.	Extremes and Ranges of Temperature.—Degrees F.																										
	1884.			1885.			1886.			1887.			1888.			1889.			Av. 17 years, 1873-89.			1890.*			1890 Higher (+), or lower (-), than Av. 17 years, 1873-89.		
	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.	Highest.	Lowest.	Range.
Year	90	-25	115	90	-24	114	93	-18	111	98	-26	124	92	-19	114	93	-15	108	94	-19	113	97	-4	101	+3	+15	-12
Av. Month	71	14	58	68	15	53	74	17	57	73	17	57	72	18	54	73	20	53	73	17	56	74	21	53	+1	+4	-3
January	44	-22	66	42	-22	64	50	-12	62	46	-26	72	36	-16	52	50	2	48	47	-11	59	63	3	60	+16	+14	+1
February	52	-18	70	45	24	69	52	-18	70	53	0	52	45	-19	64	42	-15	57	50	-10	60	61	12	49	+11	+22	-11
March	57	-13	70	44	-13	57	65	5	60	53	-1	54	69	2	67	65	8	57	60	0	60	52	-4	56	-8	-4	-4
April	74	21	53	81	17	64	80	16	64	76	14	62	81	21	60	75	20	55	78	16	62	76	20	56	-2	+4	-6
May	80	28	52	85	26	59	83	34	49	88	38	50	80	25	55	88	29	59	86	29	56	83	28	55	-3	-1	-1
June	89	43	46	86	40	46	90	41	49	91	43	48	92	39	53	85	39	46	90	40	51	92	39	53	+2	-1	+2
July	89	44	45	90	47	43	93	45	48	98	44	54	90	47	43	89	47	42	93	46	47	92	44	48	-1	-2	+1
August	90	36	54	84	42	42	91	37	54	98	37	61	90	36	54	93	42	51	93	40	53	97	34	63	+4	-6	+10
September	89	36	53	80	35	45	87	35	52	88	26	62	88	32	56	92	25	67	88	32	57	90	29	61	+2	-3	+4
October	81	22	59	72	17	55	80	30	50	73	12	61	73	26	47	73	17	56	78	21	57	76	25	51	-2	+4	-6
November	59	10	49	62	21	41	70	3	67	65	13	52	72	13	59	58	11	47	63	9	54	62	20	42	-1	+11	-12
December	53	-25	78	48	-7	55	50	-13	63	56	-3	59	52	9	43	62	14	48	53	-3	56	47	7	40	-6	+10	-16

* For the 18 years, 1873-90, the highest temperature was 101°, August 11, 1874; the lowest was -33°, February 8, 1875, and the range was 134° F.

EXHIBIT 18.—*Average Absolute Humidity, by Year and Months, in 1890, compared with Annual and Monthly Averages for 1889, and for the 13 years, 1877-89.* These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89†	3.42	1.39	1.49	1.80	2.73	3.94	5.33	6.09	5.75	4.87	3.53	2.32	1.89
1889 (9 Stations)	3.47	1.77	1.34	2.13	2.88	3.95	5.33	6.19	5.52	4.82	2.76	2.52	2.48
1890 (10 Stations)	3.52	2.02	1.95	1.73	2.93	3.72	6.23	5.95	5.46	4.59	3.66	2.46	1.60
In 1890 Greater than Av. for 13 years, 1877-89	0.10	0.63	0.46	......	0.20	......	0.90	......	......	......	0.13	0.14	......
In 1890 Less than Av. for 13 years, 1877-89	......	......	......	0.07	......	0.22	......	0.14	0.29	0.28	......	......	0.29
In 1890 Greater than in 1889	0.05	0.25	0.61	......	0.05	......	0.90	......	......	......	0.90	......	......
In 1890 Less than in 1889	......	......	......	0.40	......	0.23	......	0.24	0.06	0.23	......	0.06	0.88

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* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 18, because of a change in the location of the instruments. The amount of variation by months is shown in Exhibit C, on page 23, Report for 1886.

† Thornville for 1877-89; Kalamazoo for 1877-83, 1886-89; Mendon for 1877-82; Detroit for 1877-87; Tecumseh for 1878-85; Battle Creek for 1877-9, 1882, 1883; Otisville for 1878-80, 1882; Marquette for 1879-84, 1886-87; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-89; Agricultural College for 1877, 1881-89; Niles for 1878-79, 1881; Nirvana for 1878-79 and first four months of 1880; Reed City for last eight months of 1880 and 1881-85; Benten Harbor, Coldwater for 1877-78; Escanaba for 1880-87; Washington for 1880-83; Petoskey for 1879; Winfield for 1881, 1883; Ann Arbor for 1881-1889; Woodmere Cemetery for 1877-79; Traverse City, Marshall for 1882-89; Harrisville for 1882, 1885-86; Hastings for 1882; Hillsdale for 1882-84; Parkville for 1882; Manistique for 1884-85; Mackinaw City for 1884-87; Ionia for 1884: Swartz Creek for 1884-85; Pentwater for 1886; Gulliver Lake, Birmingham for 1887-89.

EXHIBIT 19.—*Comparison of the Average Absolute Humidity for the Year, and for each Month of the Year 1890, with Averages for the 24 Years, 1866-89, and for the Year 1889. Observations made at 7 A. M., 2 P. M. and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultvral College, near Lansing, Mich.*

Years, etc.	Absolute Humidity—Grains of Vapor in a Cubic Foot of Air.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 24 years, 1866-89.	3.47	1.44	1.53	1.85	2.69	4.05	5.61	6.42	5.93	4.81	3.32	2.21	1.69
1889	3.44	1.72	1.25	2.09	2.81	3.82	5.27	6.85	5.65	4.72	2.65	2.50	2.41
1890	3.45	2.12	2.01	1.69	2.99	3.70	6.10	5.67	5.19	4.40	3.54	2.44	1.56
In 1890 Greater than Av. for 24 years, 1866-89	......	.68	.48	......	.30	......	.49	......	......	......	.22	.23	......
In 1890 Less than Av. for 24 years, 1866-89	.02	......	......	.16	......	.35	......	.75	.74	.41	......	......	.13
In 1890 Greater than in 1889	.01	.40	.76	......	.18	......	.83	......	......	......	.89	......	......
In 1890 Less than in 1889	......	......	......	.40	......	.12	......	.68	.46	.32	......	.06	.85

EXHIBIT 20.—*Average Relative Humidity, by Year and Months, in 1890,* compared with Annual and Monthly Averages for 1889, and for the Twelve years, 1878-89. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 12 years, 1878-89†..	76	82	82	77	70	69	78	72	78	75	76	79	83
1889 (9 stations)......	77	85	88	77	71	69	80	75	70	74	78	84	84
1890 (10 stations).....	79	87	86	82	73	74	74	69	76	80	83	80	83
In 1890 Greater than Av. for 12 years, 1878-89..............	3	5	4	5	3	5	1	......	3	5	7	1	0
In 1890 Less than Av. for 12 years, 1878-89..	......	......	......	......	......	......	......	3	......	......	......	......	0
In 1890 Greater than in 1889..............	2	2	......	5	2	5	......	......	6	6	10	......	......
In 1890 Less than in 1889................	......	......	2	......	......	......	6	6	......	......	......	4	1

* Beginning with the year 1885, allowance must be made for Lansing in Exhibit 20, because of a change in the location of instruments. The amount of the variation is shown in Exhibit D, on page 23, Report for 1885.

† Thornville for 1878-89; Kalamazoo for 1878-83, 1886-89; Mendon for 1878-82; Tecumseh for 1878-85; Detroit for 1878-87; Otisville for 1878-80, 1882; Nirvana for 1878-79 and first 4 months of 1880; Reed City for last eight months of 1880 and 1881-85; Ann Arbor for 1881-89; Niles for 1878-79, 1881; Marquette for 1879-84, 1886-87; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-89; Woodmere Cemetery for 1878-79; Agricultural College for 1881-89; Escanaba for 1880-87; Washington for 1880-83; Coldwater for 1878; Petoskey for 1879; Hudson and Mallory Lake for 1881; Marshall, Traverse City for 1882-89; Hillsdale for 1882-84; Hastings for 1882; Harrisville for 1882, 1883-86; Winfield for 1883; Battle Creek for 1878-79, 1882, 1885; Manistique for 1884-85; Mackinaw City for 1884-87; Ionia for 1884; Swartz Creek for 1884-85; Pentwater for 1886; Gulliver Lake, Birmingham for 1887-89.

EXHIBIT 21.—*Comparison of the Average Relative Humidity of the Air (Per Cent of Saturation) for the Year, and for each Month of the Year 1890, with Averages for the 26 Years 1864-89, and for 1889. Observations made at 7 A. M., 2 P. M. and 9 P. M. Daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Per Cent of Saturation.—Relative Humidity.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 26 years, 1864-89 ..	79	87	86	83	70	69	76	73	76	79	79	82	86
1889..................	76	81	85	72	68	64	79	78	71	72	69	84	82
1890..................	76	87	84	79	68	70	73	65	71	76	80	77	81
In 1890 Greater than Av. for 26 years, 1864-89..............	......	0	......	......	......	1	......	......	......	......	1	......	......
In 1890 Less than Av. for 26 years, 1864-89.	3	0	2	4	2	......	3	8	5	3	......	5	5
In 1890 Greater than in 1889..............	0	3	......	7	0	6	......	......	0	4	11	......	......
In 1890 Less than in 1889................	0	......	1	......	0	......	6	13	0	......	......	7	1

TABLE IV.—Absolute Humidity.—*The Average Number of Grains of Vapor of Water in a Cubic Foot of Air for Months and Year 1890, at 18 Stations in Michigan; also Average Lines for 10 Stations and for 7 Stations.—Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers † for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Grains of Vapor in a Cubic Foot of Air—(Absolute Humidity.)												
		Year.		Months, 1890.										
		Norm. §	1890.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 10 Stations ¶	....	......	3.52	2.02	1.95	1.73	2.93	3.72	6.23	5.95	5.46	4.59	3.66	2.46	1.60
Av. for 7 Stations **	....	......	3.19	1.79	1.69	1.51	2.56	3.27	5.61	5.46	4.95	4.26	3.37	2.31	1.49
Marquette	U. P.	......	2.72	1.09	1.13	1.17	2.39	2.72	4.74	5.00	4.57	3.74	2.97	1.90	1.25
Gulliver Lake	U. P.	3.01[4]	3.06	1.48	1.49	1.36	2.26	2.91	5.28	5.45	5.03	4.33	3.29	2.21	1.60
Manistee	N. W.	......	3.12	1.73	1.58	1.47	2.43	3.07	5.61	5.34	4.90	4.11	3.25	2.34	1.58
Traverse City	N. W.	3.35[9]	3.38	1.86	1.82	1.79	2.62	3.29	5.76	5.84	5.38	4.51	3.54	2.85	1.81
Alpena	N. E.	......	3.03	1.62	1.57	1.40	2.22	2.87	5.19	5.47	4.88	4.21	3.33	2.16	1.47
Harrisville	N. E.	2.66[3]	2.70	1.19	1.11	1.04	1.98	2.61	4.74	5.27	4.67	3.94	2.98	1.88	1.01
Grand Haven	W.	......	3.23	1.89	1.81	1.54	2.51	3.33	5.67	5.29	4.96	4.24	3.38	2.46	1.63
Port Huron[4]	B. & E.	......	3.23	1.94	1.76	1.56	2.48	3.37	5.64	5.55	5.00	4.41	3.49	2.27	1.33
Thornville	B. & E.	3.62[14]	3.69	2.26	2.11	1.91	3.07	3.88	6.50	6.13	5.53	4.68	3.82	2.59	1.76
Alma	C.	......	3.50	1.87	1.90	1.69	3.06	3.83	[h]6.20	6.01	[b]5.22	[d]4.51	3.71	2.51	[i]1.49
Agricultural College	C.	3.48[11]	3.45	2.12	2.01	1.69	2.99	3.70	6.10	5.67	5.19	4.40	3.54	2.44	1.56
Lansing, S. B. of H.‖	C.	3.38[12]	3.39	1.95	1.87	1.55	2.81	3.68	6.13	5.67	5.16	4.41	3.54	2.39	1.48
Otsego	S. W.	......	††	.....	2.13	1.80	3.22	4.10	6.84	5.93	5.53	4.78	3.90	2.67	1.81
Albion	S. C.	......	3.52	2.03	1.96	1.66	2.91	3.87	6.39	5.91	[a]5.47	4.60	3.52	2.43	1.45
Ann Arbor	S. C.	3.48[10]	3.77	2.18	2.11	1.87	2.93	[c]4.00	6.74	[c]6.75	[c]6.29	4.60	3.69	2.37	[c]1.68
Kalamazoo	S. C.	......	3.55	2.11	2.09	1.74	3.05	3.83	6.48	5.91	5.15	4.53	3.55	2.48	1.69
Marshall	S. C.	3.71[9]	3.76	2.35	2.22	1.91	3.49	4.01	6.38	5.90	5.81	5.00	3.81	2.64	1.63
Birmingham	S. E.	3.51[4]	3.73	[a]2.09	[g]1.98	1.83	3.14	[b]4.03	[e]6.81	[c]6.16	[f]5.58	[d]4.86	[a]4.11	2.67	1.54
Detroit	S. E.	......	3.42	2.12	1.88	1.68	2.82	3.70	5.92	5.64	5.16	4.55	3.61	2.53	1.48

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* At the U. S. Signal Service Stations and Kalamazoo, for the year 1890, the observations were made at 8 A. M. and 8 P. M., 75th meridian time. The local time corresponding to these hours is stated in the star (*) foot-note to Table I., page 23.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Absolute Humidity for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the Absolute Humidity, denote the number of years included in the average.

‖ The number of grains of vapor in a cubic foot of air at each observation was determined from readings of the psychrometer by means of Glaisher's table, Table XII. of the Smithsonian Meteorological and Physical Tables (1859).

¶ This line is an average for only the stations at which observations were made tri-daily, and from which statements, nearly complete, were received for every month in the year. It does not include the lines for Harrisville, Otsego, Kalamazoo and the U. S. Signal Service Stations.

** This line is an average for 6 U. S. Signal Service Stations and Kalamazoo.

†† The average for 11 month in 1890 is 3.88.

[The remaining foot-notes are on page 38.]

The lines for 7 stations in Table IV. are graphically represented in Diagram III., page 35.

DIAGRAM III.—ABSOLUTE HUMIDITY, BY MONTHS, 1890.

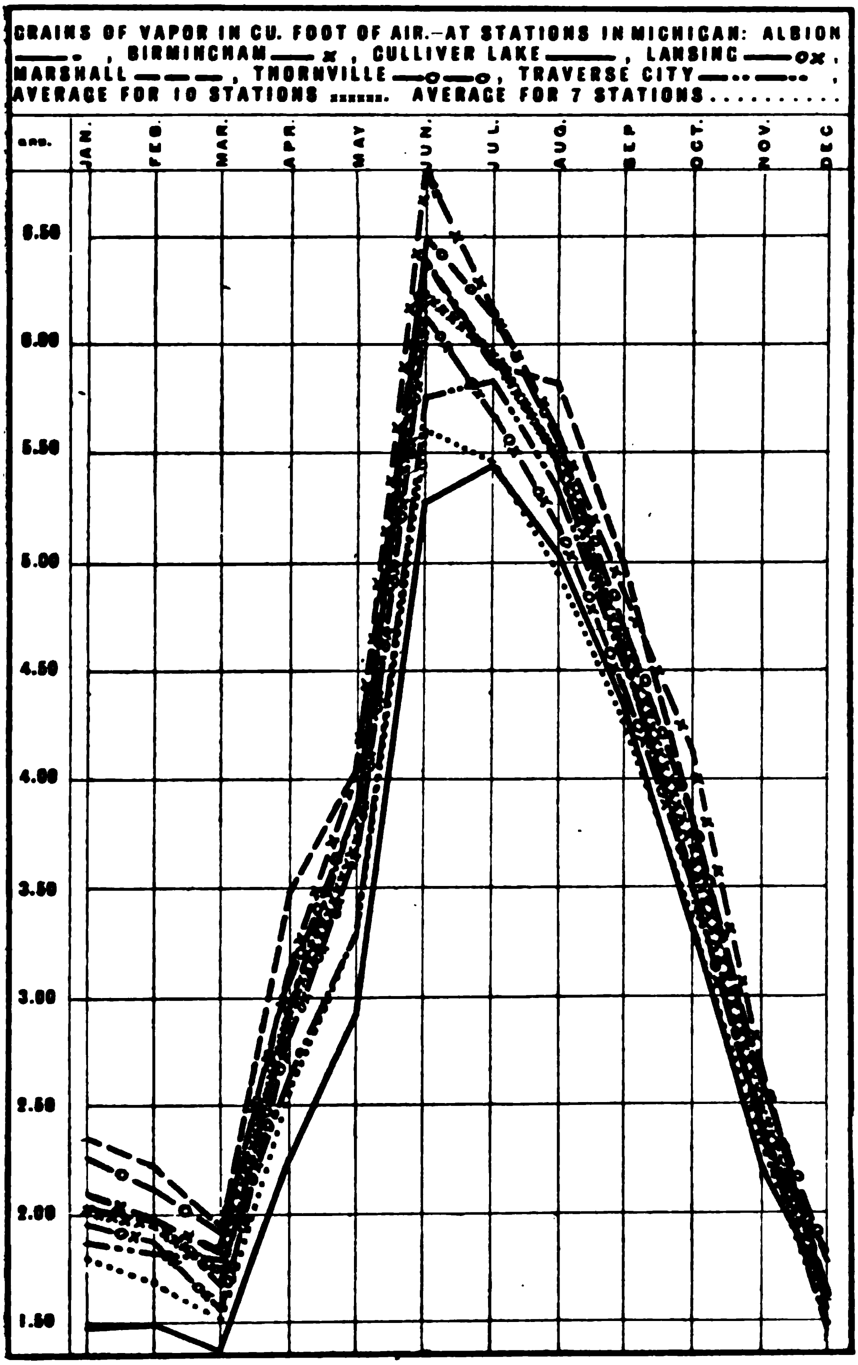


TABLE V.—Relative Humidity.—*Average Per Cent of Saturation of the Atmosphere with Vapor of Water during the Year, and during each Month of the Year 1890, at 17 Stations in Michigan; also Average lines for 10 Stations and for 7 Stations.—Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,* by Observers† for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Per Cent of Saturation.—Relative Humidity.													
		Year.		Months, 1890.											
		Norm. §	1890.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
Av. for 10 Stations‖	....	......	79	87	86	82	73	74	74	69	76	80	83	80	83
Av. for 7 Stations¶	....	......	77	83	82	78	71	73	75	70	73	76	81	78	80
Marquette	U. P.	......	76	76	77	76	77	78	73	71	75	73	78	76	76
Gulliver Lake	U. P.	84^{4}	83	93	90	85	76	76	75	80	82	83	84	86	89
Manistee	N. W.	......	77	85	81	78	70	72	78	71	74	75	80	78	77
Traverse City	N. W.	82^{9}	80	91	88	91	74	74	73	69	74	76	82	79	89
Alpena	N. E.	......	81	88	87	85	73	72	76	76	78	81	87	84	87
Grand Haven	W.	......	75	82	82	77	64	73	74	67	73	75	80	75	78
Port Huron	B. & E.	......	76	81	81	76	71	73	76	69	73	76	81	77	76
Thornville	B. & E.	79^{13}	80	90	88	86	74	78	73[h]	68	74[b]	77[d]	84	79	88[i]
Alma	C.	......	77	81	84	79	74	73	76	66	69	76	84	81	77
Agricult. College	C.	79^{27}	76	87	84	79	68	70	73	65	71	76	80	77	81
Lansing, S. B. of H.	C.	72^{12}	73	79	79	71	64	68	71	63	71	75	79	74	76
Otsego	S. W.	......	**	.....	87	82	72	77	78	67	75[a]	81	88	84	88
Albion	S. C.	......	77	84	84	77	72	75[c]	71	65[c]	74[c]	80	81	81	74[c]
Ann Arbor	S. C.	78^{1}	84	88	89	86	73	78	80	78	91	94	85	78	89
Kalamazoo	S. C.	......	77	86	85	80	69	72	75	67	69	77	80	76	85
Marshall	S. C.	78^{9}	81	94[a]	90[g]	86	80	75[b]	72[e]	63[c]	76[f]	85[d]	87[a]	82	84
Birmingham	S. E.	77^{4}	78	81	80	79	73	77	76	70	77	81	85	80	78
Detroit	S. E.	......	76	83	81	76	71	72	72	66	72	77	80	79	80

Note.—The observations with the psychrometer at Marquette, Manistee, Grand Haven, Port Huron and Detroit for 1890 were reduced (by tables in "Signal Service Order No. 41," 1881, and in "Instructions to Voluntary Observers," 1882), and the monthly means for those months were computed, by the observers at those stations. In all other cases the observations were reduced by Guyot's table, in Smithsonion Meterorological Tables, or by a table substantially the same as that. Computations for Ann Arbor and Albion in 1890 were made by the observers there. All other computations in Table V. were made at the office of the State Board of Health.

* At the Stations of the U. S. Signal Service and Kalamazoo during the year 1890, the observations were made at 8 A. M. and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 23.

† The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2.

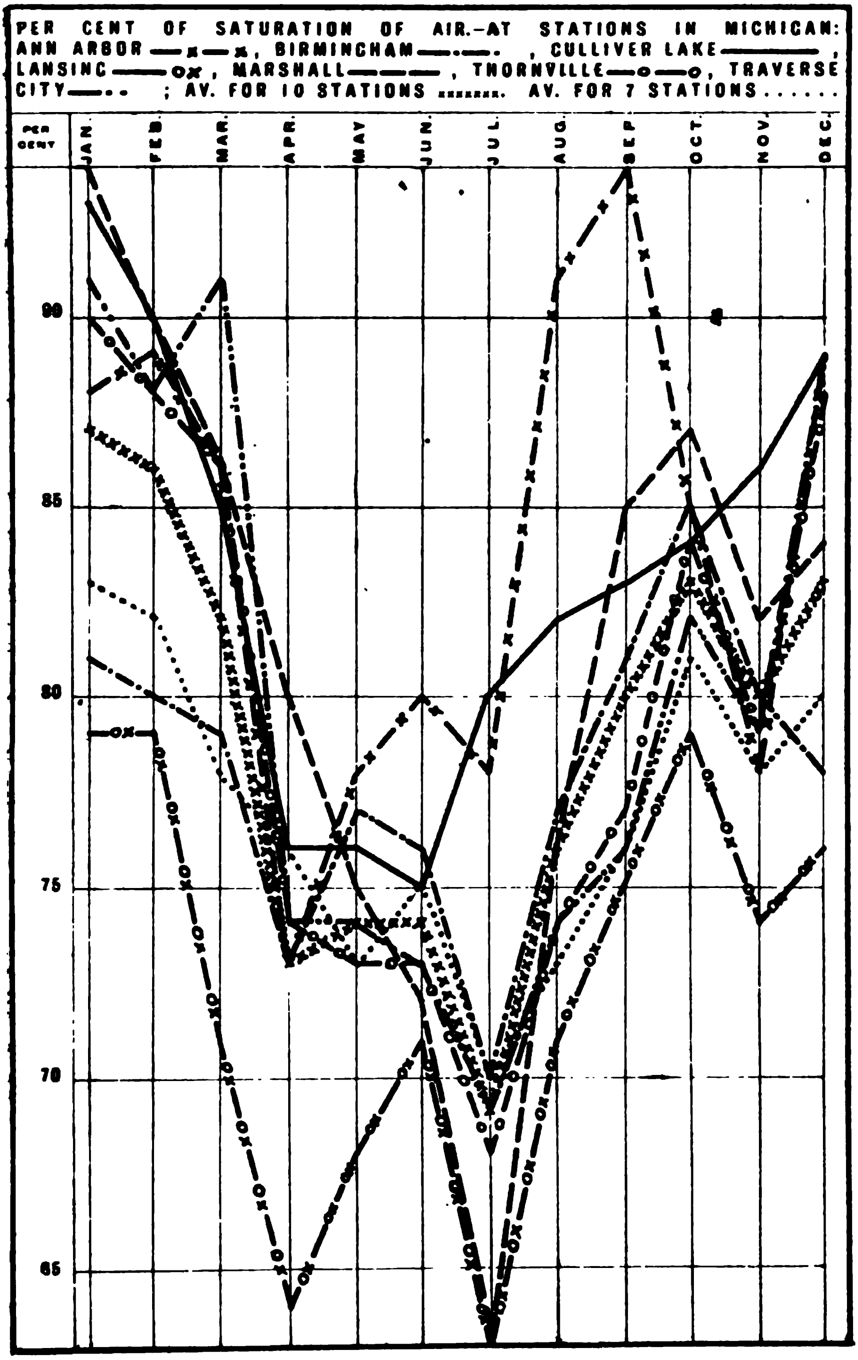
‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

§ Numbers in this column state the average annual Relative Humidity for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of the numbers which state the Relative Humidity, denote the number of years included in the average.

[The remaining foot-notes are on page 38.]

Graphic representations of 9 representative lines in Table V. are given in Diagram IV., page 37.

DIAGRAM IV.—RELATIVE HUMIDITY, BY MONTHS, 1890.



FOGS.

For the year 1890, fog was reported at 165 morning observations, at 20 afternoon observations (at about 2 P. M.), at 34 evening observations (at about 9 P. M.), and 47 times during the day, no special time being mentioned, in many cases the same fog or fog at the same time, being reported by different observers. Fog was reported, at one or more stations at some time during the day, on 109 days.

EXHIBIT 22.—*Number of different days on which Fog was Observed at One or more of 19 Stations in Michigan * in 1890, and in each month of the Year 1890.*

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
109	10	10	4	7	8	15	7	7	12	16	4	9

NOTE.—Graphic representations of statements in Exhibit 22 are given in Diagam V., page 39.

* This Exhibit contains statements only for those localities from which reports were received for every month of the year, as follows: Marquette, Gulliver Lake, Manistee, Traverse City, Alpena, Harrisville, Grand Haven, Alma, Agricultural College, Albion, Port Huron, Thornville, Lansing, Otsego, Ann Arbor, Kalamazoo, Parkville, Birmingham and Detroit.

EXHIBIT 23.—*Number of Observations at which Fog was Observed in Michigan in 1890, and in each Month of the Year 1890. (Observation taken 3 times Daily,* at 19 Stations.†)*

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
266	42	22	13	12	19	32	12	16	19	48	4	27

* At the U. S. Signal Service Stations the observations were made at 8 A. M. and 8 P. M., 75th Meridian time.

† This exhibit contains statements only for those localities from which registers were received for every month of the year; the localities are stated in a foot-note to Exhibit 22 above.

[Foot-notes to Table IV., page 34.

‖ Beginning with the year 1885, allowance must be made for Lansing in Table IV., because of a change in the location of the instruments. The amount of the variation by months is shown in Exhibit C, page 23. Report for 1886.

NOTE.—The computations of Absolute Humidity at Ann Arbor and Albion for each month in 1890, were furnished by the observer there. All other computations in Table IV. were made at the office of the Secretary of the State Board of Health.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations. d For 89 observations.
e For 88 observations. f For 87 observations. g For 83 observations. h For 68 observations.
i For 57 observations.

| Foot-notes to Table V., page 36.]

| This line is an average for only the stations at which observations were made tri-daily and from which statements, nearly complete, were received for every month in the year. It does not include Otsego, Kalamazoo and the U. S. Signal Service Stations.

¶ This line is an average for 6 U. S. Signal Service Stations and Kalamazoo.

** The average for 11 months in 1890 is 80.

¶¶ Beginning with the year 1885, allowance must be made for Lansing in Table V., because of a change in location of the instruments. The amount of the variation by months is shown in Exhibit D., page 23, Report of 1886.

a. b. c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations. b For 91 observations. c For 90 observations.
d For 89 observations. e For 88 observations. f For 87 observations.
g For 83 observations. h For 68 observations. i For 57 observations.

DIAGRAM V.—CONCERNING FOGS IN MICHIGAN, IN 1890.

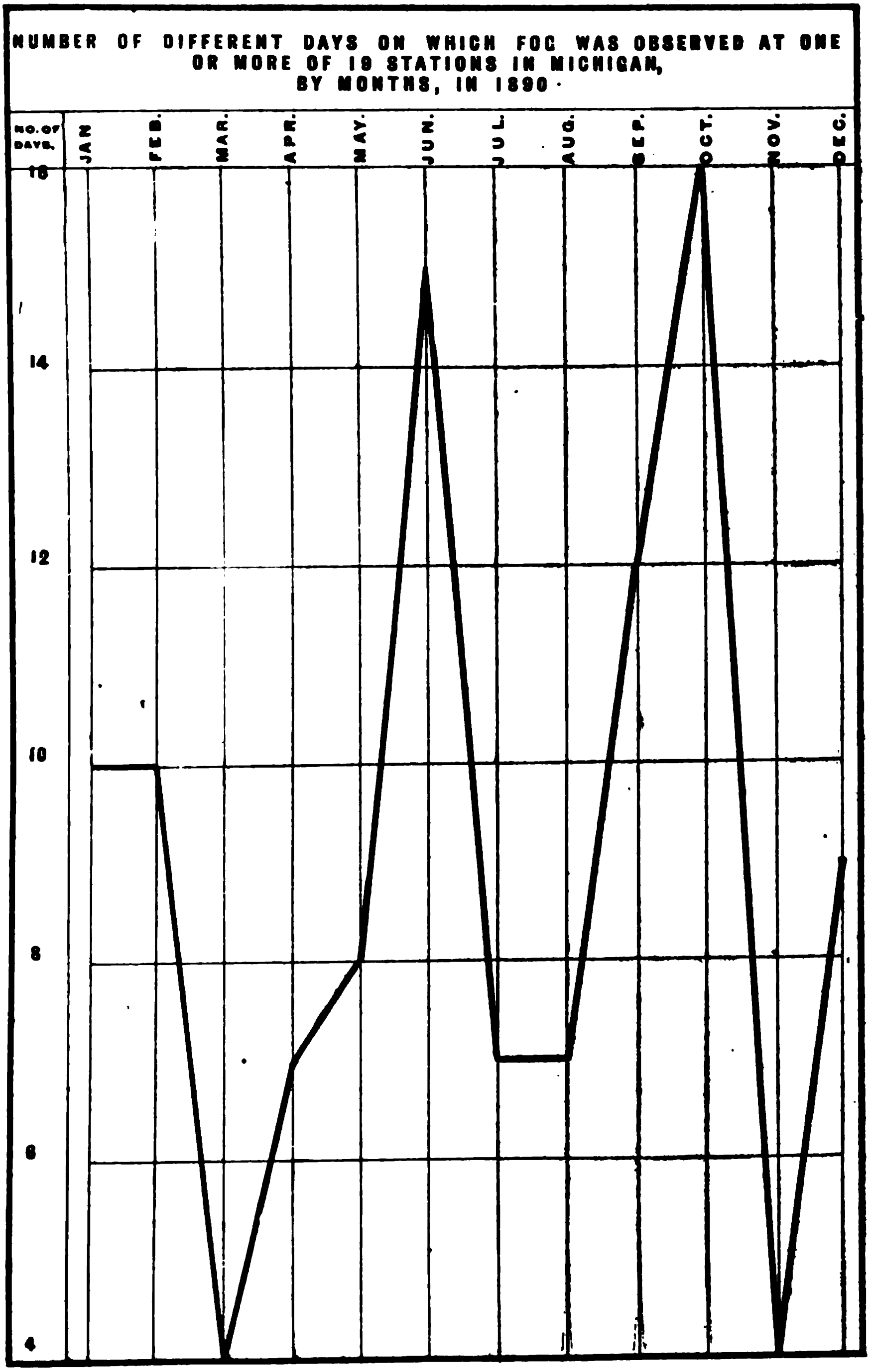


EXHIBIT 24.—*Number of different Days on which Fog was recorded in 1890, and at 19 Stations*

Stations in Michigan.*	No. of days in 1889.	January.			February.			Line Number.
		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
			A. M.	P. M.		A. M.	P. M.	
Marquette	10	0			0			1
								2
								3
Gulliver Lake	15	30	3 to 8		0			4
								5
								6
								7
								8
Manistee	7	0			0			9
								10
								11
Traverse City	4	0			0			12
								13
Alpena	16	1		8:00	4	11:30 to	5:00	14
		5		6:30 to 11:00				15
		26		4:00 to 7:30				16
								17
Harrisville	4	26, 30			0			18
Grand Haven	25	5	9:00 to	7:00	4	Early to	1:00	19
		19		Evening	14	8:00		20
		26	9:00	7:30	24	Early to	3:00	21
Port Austin	4	30	7:00		0			22
Port Huron	25	4		Night till	10		Night till	23
		5	10:30		11	9:30		24
		25		Night till	17		Night till	25
		26		Midnight	18	10:00		26
								27
Thornville	10	5	7:00		0			28
		12	till noon					29
		26	A. M.	P. M.				30
Alma	2	0			0			31
Agricultural College	6	0			18	7:00		32
Lansing, S. B. of H.	25	5, 11, 26	7:00		4, 18, 24	7:00		33
								34
Otsego	15	26	7:00	2:00	0			35
		30	7:00					36
Albion	22	19		9:00	24		9:00	37
		26	7:00	2:00 & 9:00				38
		30	7:00					39
Ann Arbor	15	26	7:00	2:00 & 9:00	4, 11, 28	7:00		40
					24		Evening till 10:00	41
Kalamazoo	11	12, 30	7:00		0			42
		26	7:00	7:00				43
Parkville	34	5, 26, 28, 30			2, 3, 24			44
Birmingham	13	26		2:00	11	7:00		45
Detroit	19	5, 11, 30	8:00		4, 11	8:00		46
		26	8:00	8:00				47

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* The names of observers, their places of observation, and the counties in which the places are situated are stated in Exhibit 1, page 2.

in each Month, the dates and hours of Observation† when Fogs were recorded in Michigan.

Line Number.	March.			April.			May.			June.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			0			30, 31	8:00		4, 5		8:00
2							20			11	8:00	8:00
3										28, 29	8:00	
4	0			23	7:00		20	7:00		3, 5, 22	7:00	
5										10		9:00 till
6										11	8:00	
7										15		7:00 till
8										16	9:00	
9	0			0			0			11	8:30	8:00
10										13, 15		8:00
11										22		8:00
12	0			0			0			4, 16	7:00	
13										11, 15		9:00
14	0			8	10:15 to	1:50	0			4	{ Early till 9 }	4:00 till
15										5	7:00 till	9:00
16										11		in night
17										16		8 to 11:00
18	0			0			0			16		
19	11	11:00 to	5:00	23	8:00		23	{ Early till noon }		16	{ Early to 7:50 }	
20										22	8:15 to 9:40	
21												
22	0			4, 13	7:00		0			16	7:00	
23	12		night till	3		night till	4	during	day	11		night till
24	18	10:30		4	10:30		30		night till	12	9:35	
25				8		8:00	31	9:30				
26				8		night till						
27				9	9:30							
28	11	Morning		0			18	A. M.		0		
29												
30												
31	0			0			0			0		
32	0			9	7:00		31	7:00		0		
33	11		9:00				18, 31	7:00		16, 21	7:00	
34	12	7:00		9	7:00							
35	11, 12		P. M.	0			0			12, 18	Sunrise	
36										16		
37	11		9:00	0			13	7:00		0		
38												
39												
40	0			9	7:00		0			21	7:00	
41												
42	21	7:00		0			18	7:00		0		
43												
44	12, 21			0			12, 13, 31			{ 16, 17 21, 23		
45	0			4, 9, 28, 30	7:00		5	7:00		0		
46	0			28	8:00		5	8:00		0		
47												

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† At the U. S. Signal Service Stations during 1890, the observations were made at 8 A. M. and 8 P. M., 75th Meridian time, unless otherwise stated in the exhibit.

NOTE.—Registers were received, but with no fog recorded thereon, from Battle Creek, Marshall and Tecumseh, for each month in 1890. A cipher (0) indicates that a monthly register was received from the station with no fog recorded thereon.

EXHIBIT 24.—CONTINUED.—*Dates when*

Stations in Michigan.	July.			August.			September.			Line number.
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.	
Marquette	23		8:00	0			0			1
Gulliver Lake	12, 18	7:00		0			30	4 to 8		2
Manistee	15, 24	8:00		0			0			3
	12		8:00							4
Alpena	0			0			2		Night till	5
							3	10:30		6
							4	8:00		7
										8
Harrisville	0			0			0			9
Grand Haven	13	8:00		20	Early to 8:00		12	Early to 9:30		10
	15		12 to 2				29	Early to 8:30		11
	24	Early to 9:00								12
										13
Port Huron	0			25		Night till	1	Night till daylight		14
				26	10:00		1		Night till	15
							2	9:30		16
Thornville	0			0			0			17
Alma	0			0			0			18
Agr'l College	0			25		9:00	0			19
Lansing, S. B. of H.	0			25		7:00 till	16		Night till	20
				26	7:00		17	6:00		21
				26		*6:45				22
										23
										24
										25
										26
Otsego	0			27	A. M.		17, 22			27
				28			29	7:00		28
Albion	0			25		*7:00	16		Night till	29
				26		9:00	17	7:00		30
				30, 31		in night	28		6:30*	31
										32
										33
										34
										35
										36
										37
										38
										39
Ann Arbor	0			0			3, 17	7:00		40
										41
Kalamazoo	13	7:00		0			22	7:00		42
Parkville	13,24,27			26, 27, 28, 31			12,17,22			43
Birmingham	14	7:00		26	7:00		0			44
										45
Detroit	0			26	8:00		2, 18	8:00		46

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* Lifted in night.

Fogs were recorded in 1890.

Line number.	October.			November.			December.		
	Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.		Day of Month.	Hour of Observation.	
		A. M.	P. M.		A. M.	P. M.		A. M.	P. M.
1	0			0			31	8:00	8:00
2	3, 4	7:00		0			0		
3	0			0			0		
4									
5	3		9:30 to 11:30	0			0		
6	4		7:00 till						
7	5	11:50							
8	22	6:00 to 9:00							
9	4			0			0		
10	2	Early to noon.		14	Early to 9:00		8	Early to 9:00	
11	3	7:50 to 8:30					11	Early to 9:30	
12	5	7:45 to 8:30					31	A. M.	P. M.
13	24	Early to 11:00							
14	22	8:00					31		Night till 2:50
15									
16									
17	1, 2	Morning		0			17, 18, 31		
18	3	7:00		29			0		
19	9, 24	7:00		0			0		
20	8		Night till	0			31	7:15 till	night
21	9	7:30							
22	13	7:00							
23	20		Night till						
24	21	8:30							
25	23		Night till						
26	24	9:10							
27	20			0			0		
28	21, 24	7:00							
29	2	Night of 1st	till 8:00	0			0		
30									
31	3	Night of 2d	till 8:30						
32	6		8:00 till						
33	7	8:00							
34	7		7:30 till						
35	8	9:00							
36	20		Night till						
37	21	7:00							
38	24	Night of 23d	till 11:00						
39	30	Night of 29th	till 9:00						
40	2, 5, 9	7:00		0			6, 18	7:00	
41							31	7:00	2:00 and 9:00
42	2, 3, 5, 24	7:00		0			0		
43	1,2,3,20,24			0			18, 19, 20		
44	2, 3	7:00		0			6	7:00	
45							31	7:00	2:00
46	3, 5, 9	8:00		6, 12	8:00		11, 15, 17	8:00	

TABLE VI.—*Average Per Cent of Cloudiness for the Year, and for each Month of the Year 1890, at each of 19 Stations in Michigan, and also the Average lines for 12 Stations, and for 7 Stations. Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M., *by Observers for the State Board of Health, †and for the U. S. Signal Service.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Division of the State.‡	Average Per Cent of Cloudiness.													
		Year.		Months, 1890.											
		Norm. ‖	1890	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations §	....	......	56	72	69	56	44	60	48	35	48	48	71	61	66
Av. for 7 Stations ¶	....	......	58	73	71	53	48	64	48	42	48	45	66	62	65
Marquette	U. P.	......	59	67	75	58	53	62	47	50	56	46	58	70	69
Gulliver Lake	U. P.	56[4]	60	69	78	53	44	63	50	49	56	46	67	73	70
Manistee	N. W.	......	51	78	68	55	40	52	31	37	46	31	61	56	58
Traverse City	N. W.	60[9]	62	85	78	67	[f]46	58	[g]45	46	[a]53	46	75	68	73
Alpena	N. E.	......	63	68	80	56	52	78	54	54	53	49	68	67	75
Harrisville	N. E.	60[6]	62	71	79	53	43	77	60	44	56	48	79	64	74
Grand Haven	W.	......	58	88	72	70	47	68	50	36	42	44	58	67	60
Port Austin*	B. & E.	......	**	[j]57	[m]55	[l]35	[l]28	[j]43	[k]19	[e]21	[o]36	.....	.....	.....	.....
Port Huron	B. & E.	.....	58	70	71	56	50	58	53	41	50	48	73	61	65
Thornville	B. & E.	52[14]	51	65	62	52	39	57	48	28	32	41	70	57	64
Alma	C.	......	51	69	64	53	39	62	[n]42	23	29	41	[a]66	65	61
Agr'l College	C.	58[27]	55	72	69	56	46	58	50	33	42	48	70	57	62
Lansing, S. B. of H.	C.	56[12]	57	72	63	55	48	54	53	43	45	50	70	65	64
Otsego	S. W.	......	51	[d]75	[i]67	53	35	53	37	21	37	46	72	54	56
Albion	S. C.	......	62	78	74	62	48	59	49	39	[a]48	63	75	69	76
Ann Arbor	S. C.	58[11]	57	73	69	59	47	60	47	[a]36	42	57	72	59	67
Battle Creek	S. C.	......	††	[c]68	71	51	37	59	21	14	[b]35	.....	62	55	58
Kalamazoo	S. C.	......	57	79	68	55	46	68	43	39	41	49	76	52	64
Marshall	S. C.	53[10]	45	68	59	45	35	48	31	17	33	36	62	46	55
Birmingham	S. E.	60[4]	60	[h]69	[k]71	[f]61	[d]55	[g]68	[j]63	[j]35	[l]48	[i]53	[b]71	[d]58	[f]65
Detroit	S. E.	......	57	66	65	58	50	61	57	39	45	48	66	59	67

* At Stations of the U. S. Signal Service and Kalamazoo, during the year 1890, the observations were made at 8 A. M. and 8 P. M., 75th meridian time. The corresponding local time for each of the stations is stated in the star (*) foot-note to Table I., page 23.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ The full names of divisions and the counties in each division are stated Exhibit I. in a paper which follows on weekly reports of sickness.

‖ Numbers in this column state the average per cent of cloudiness for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the per cent of cloudiness, denote the number of years included in the average.

NOTE TO TABLE VI.—Computations of average per cent of cloudiness were made and furnished by the observers at Marquette, Manistee, Ann Arbor, Grand Haven, Alpena, Port Huron, Albion and Detroit for each month in 1890. At Kalamazoo for the months Jan., Feb., May. Aug., Sept. and Nov. All other computations in Table VI. were made at the office of the State Board of Health.

[The remaining foot-notes are on page 47.]

Graphic representations of 9 representative lines in Table VI., are given in Diagram No. VI., page 45.

DIAGRAM VI.—AV. PER CT. OF CLOUDINESS, BY MONTHS, 1890.

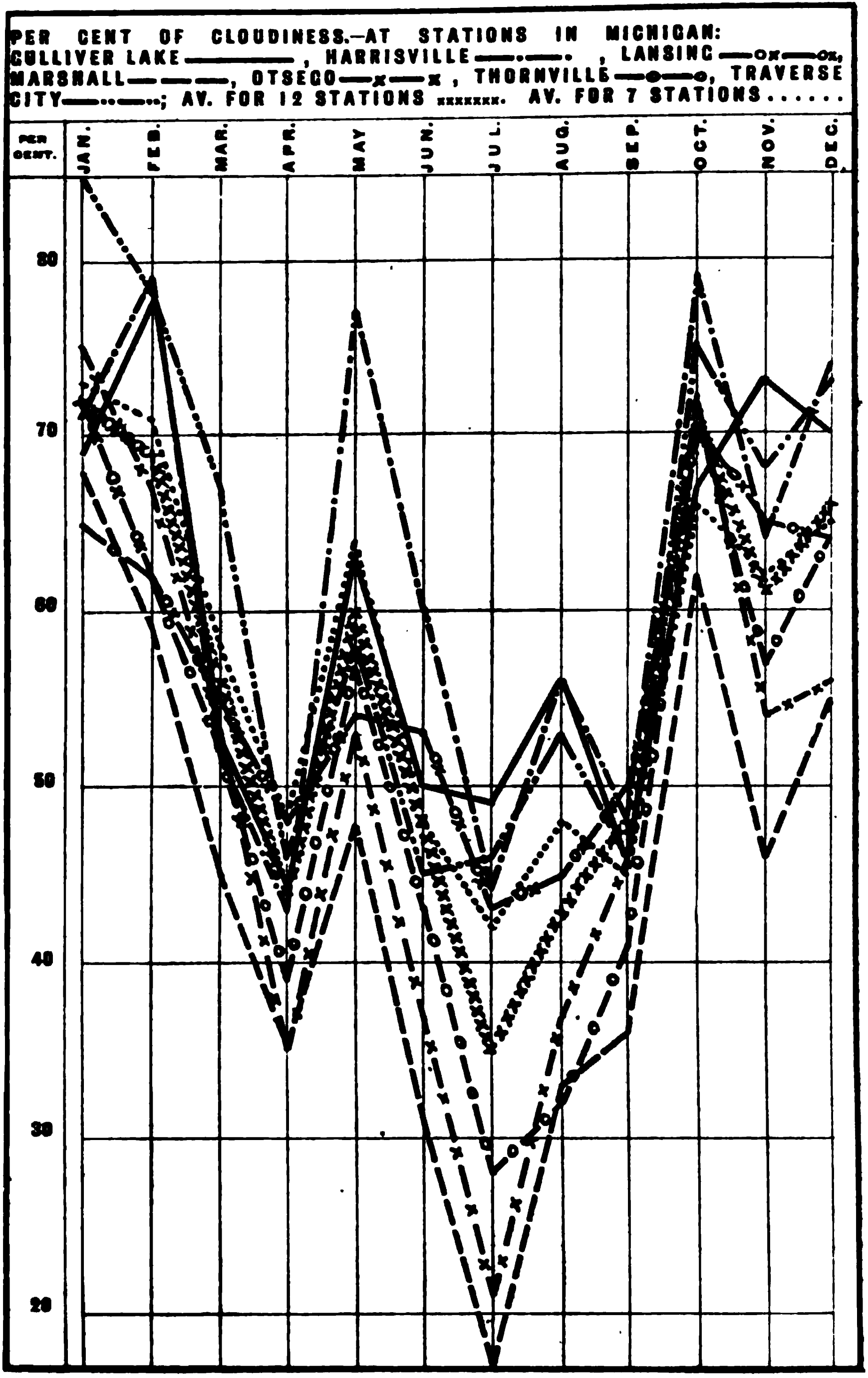

EXHIBIT 25.—*Average Per Cent of Cloudiness by Year and Months, in 1890*, Compared with Annual and Monthly Averages for 1889, and for Thirteen Years 1877–89. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89*..	56	70	64	58	52	49	48	41	43	45	58	68	76
1889 (11 Stations)......	56	72	70	49	55	54	68	37	33	42	58	72	64
1890 (12 Stations)......	56	72	69	56	44	60	48	35	43	48	71	61	66
In 1890 Greater than Av. for 13 years, 1877-89..............	0	2	5	......	......	11	0	......	0	3	13	......	......
In 1890 Less than Av. for 13 years, 1877-89..	0	......	......	2	8	......	0	6	0	......	......	7	10
In 1890 Greater than in 1889..............	0	0	......	7	......	6	......	......	10	6	13	......	2
In 1890 Less than in 1889................	0	0	1	......	11	......	20	2	......	......	......	11	......

* Thornville, Kalamazoo for 1877-89; Mendon for 1877-83; Tecumseh for 1877-85; Battle Creek for 1877-80, 1882-85, 1888-89; Nirvana for 1877-79 and first 4 months of 1880; Reed City for last 8 months of 1880 and 1881-85; Detroit for 1877, 1879-87; Niles for 1878-81; Benton Harbor for 1877-78, 1880; Coldwater, Woodmere Cemetery (near Detroit) for 1877-79; Otisville for 1878-80, 1882; Marquette for 1879-84, 1886-87; Alpena, Grand Haven, Port Huron for 1879-87; Lansing for 1879-89; Washington for 1879-88; Ypsilanti for 1877, 1879; Agricultural College for 1877, 1881-89; Petoskey for 1878-79; Escanaba for 1880-87; Ann Arbor for 1880-'9; Fife Lake for 1877; Ionia for 1880, 1883-85; Adrian for 1880; Hillsdale for 1880, 1882-84; Marshall for 1881-89; Parkville for 1881-82; Winfield for 1881, 1883; Hudson and Mallory Lake for 1881; Harrisville for 1882, 1885-89; Hastings for 1882; Traverse City for 1882-89; Port Austin for 1883; Manistique for 1884-5; Mackinaw City for 1884-87; Swartz Creek for 1884-85; Pentwater, East Saginaw for 1886; Otsego for 1886-87; Gulliver Lake, Birmingham for 1887-89.

EXHIBIT 26.—*Comparison of the Average Per Cent of Cloudiness in the Year and each Month of the Year 1890, with Averages for the Twenty-six Years, 1864–89, and for the Year 1889. Observations made at 7 A. M., 2 P. M., and 9 P. M., Daily, by Prof. R. C. Kedzie, at the State Agrivultural College, near Lansing, Mich.*

Years, etc.	Per Cent of Cloudiness.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 26 years, 1864-89.	58	73	65	62	56	51	50	45	46	48	59	67	75
1889................	56	71	73	51	56	52	65	42	32	40	64	72	55
1890................	55	72	69	56	46	58	50	33	42	48	70	57	62
In 1890 Greater than Av. for 26 years, 1864-89.....	......	......	4	......	......	7	0	......	......	0	11	......	......
In 1890 Less than Av. for 26 years, 1864-89............	3	1	......	6	10	......	0	12	4	0	......	10	13
In 1890 Greater than in 1889.......	......	......	4	5	......	6	......	......	10	8	6	......	7
In 1890 Less than in 1889..............	1	1	......	......	10	......	15	9	......	......	......	15	......

EXHIBIT 27.—*Dates of Auroras Observed and recorded at 4 Stations in Michigan during the Year 1890.*

Stations.	Dates of Auroras recorded in 1890.											
	Jan.	Feb.	Mar.	April.	May.	June.	July.	August.	September.	Oct.	Nov.	Dec.
Gulliver Lake	17, 20	......	22	18	......	......	......	14, 16, 18, 19	10, 11, 13, 14, 15, 16, 23, 24	15, 17	7, 12	......
Alpena	......	......	......	......	......	......	......	......	......	17	13	......
Thornville	......	......	......	......	......	......	17	......	......	17	13	......
Lansing, S. B. of H.	......	......	......	......	......	......	......	......	......	17	......	......

Polar bands, Nov. 29.—*Thornville.*

SUNSHINE AND CLOUDS.

On the back of each blank register supplied by this Board to Observers, on which they are to register meteorological data, is a statement that "One observer has reported a record of days 'all or nearly all cloudy' and days 'all or nearly all sunshine.' The State Board of Health would be glad to have such a report from all observers who can conviently make it. Memoranda may be made in a column headed 'cloudy or sunny,' days more than 80 per cent of clouds being marked with the abbreviation 'C,' indicating *cloudy*, and days with less than 20 per cent of clouds, with an 'S,' indicating *sunshine*."

The following are statements of the days in each month which were reported "Sunny," "Clear," "Fair," "Partly Cloudy," and "Cloudy," by observers at stations in Michigan, except Thornville, concerning which a note is given explaining the method of statement, and Gulliver Lake, where the "Hours of Sunshine" were recorded.

GULLIVER LAKE.

JAN.—Hours of sunshine, 104.
FEB.—Hours of sunshine, 75½.
MAR.—Hours of sunshine, 201.
APRIL.—Hours of sunshine, 254½.
MAY.—Hours of sunshine, 178.
JUNE.—Hours of sunshine, 305.
JULY.—Hours of sunshine, 249½.
AUG.—Hours of sunshine, 212½.
SEPT.—Hours of sunshine, 211½.
OCT.—Hours of sunshine, 114¼.
NOV.—Hours of sunshine, 90.
DEC.—Hours of sunshine, 80.

[Foot-notes to Table VI., page 44.]

§ This line is an average for only the stations at which tri-daily observations were made and from which statements, nearly complete, were received for every month of the year. It does not include the line for Port Austin, Battle Creek, Kalamazoo and the U. S. Signal Service Stations.

¶ This line is an average for six U. S. Signal Service Stations and Kalamazoo.

** The average for 8 months is 37. †† For 11 months, 48.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 92 observations.	b For 91 observations.	c For 90 observations.	d For 89 observations.
e For 88 observations.	f For 87 observations.	g For 86 observations.	h For 84 observations.
i For 81 observations.	j For 80 observations.	k For 79 observations.	l For 76 observations.
m For 71 observations.	n For 68 observations.	o For 67 observations.	

ALPENA.

JAN.—Sunny, 21, 22, 24, 28—4 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 25, 26, 27, 29, 30, 31—27 days.

FEB.—Sunny, 13, 22. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28—26 days.

MARCH.—Sunny, 1, 2, 5, 6, 7, 8, 9, 16, 17, 18, 23, 29, 30—13 days. Cloudy, 3, 4, 10, 11, 12, 13, 14, 15, 19, 20, 21, 22, 24, 25, 26, 27, 28, 31—18 days.

APRIL.—Sunny, 1, 2, 5, 11, 12, 15, 16, 17, 18, 19, 20, 21, 24, 25—14 days. Cloudy, 3, 4, 6, 7, 8, 9, 10, 13, 14, 22, 23, 26, 27, 28, 29, 30—16 days.

JUNE.—Sunny, 1, 7, 8, 9, 14, 18, 19, 20, 21, 22, 24, 25, 26, 28, 29—15 days. Cloudy, 2, 3, 4, 5, 6, 10, 11, 12, 13, 15, 16, 17, 23, 27, 30—15 days.

JULY.—Sunny, 4, 5, 7, 9, 10, 13, 14, 18, 20, 21, 27, 28, 29—13 days. Cloudy, 1, 2, 3, 6, 8, 11, 12, 15, 16, 17, 19, 22, 23, 24, 25, 26, 30, 31—18 days.

AUG.—Sunny, 1, 2, 5, 6, 7, 11, 12, 14, 17, 30, 31—11 days. Cloudy, 3, 4, 8, 9, 10, 13, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29—20 days.

SEPT.—Sunny, 9, 10, 14, 21, 22, 23, 24, 25, 27, 28, 29, 30—12 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 19, 20, 26—18 days.

OCT.—Sunny, 1, 8, 15, 18, 21, 22—6 days. Cloudy, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 19, 20, 23, 24, 25, 26, 27, 28, 29, 30, 31—25 days.

NOV.—Sunny, 5, 10, 11, 12, 13, 14, 16, 19, 20, 21—10 days. Cloudy, 1, 2, 3, 4, 6, 7, 8, 9, 15, 17, 18, 22, 23, 24, 25, 26, 27, 28, 29, 30—20 days.

DEC.—Sunny, 7, 8, 18. Cloudy, 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31—28 days.

MANISTEE.

JAN.—Clear, 2, 3, 7, 27, 28—5 days. Fair, 9, 14, 30. Cloudy, 1, 4, 5, 6, 8, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 29, 31—23 days.

FEB.—Clear, 6, 13, 15, 16, 22—5 days. Fair, 10, 12, 17, 19, 21—5 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 9, 11, 14, 18, 20, 23, 24, 25, 26, 27, 28—18 days.

MARCH.—Clear, 6, 7, 8, 9, 13, 22—6 days. Fair, 5, 14, 16, 17, 18, 19, 20, 21, 23—9 days. Cloudy, 1, 2, 3, 4, 10, 11, 12, 15, 24—9 days.

APRIL.—Clear, 1, 2, 4, 5, 6, 7, 11, 12, 14, 15, 16, 17, 19, 20, 21, 22, 24, 25, 27—19 days. Fair, 10, 23, 28, 29, 30—5 days. Cloudy, 3, 8, 9, 13, 18, 26—6 days.

MAY.—Clear, 1, 2, 3, 7, 11, 14, 15, 25—8 days. Fair, 4, 6, 10, 13, 16, 17, 19, 20, 22—9 days. Cloudy, 5, 8, 9, 12, 18, 21, 23, 24, 26—9 days. (No record for the rest of the month.)

JUNE.—Clear, 1, 2, 5, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 26, 27, 28, 29—21 days. Fair, 4, 11, 21, 25, 30—5 days. Cloudy, 3, 10, 20.

JULY.—Clear, 3, 4, 5, 7, 8, 9, 10, 11, 13, 15, 16, 18, 19, 20, 21, 22, 26, 27, 28, 29—20 days. Fair, 1, 12, 17, 23, 24, 25, 31—7 days. Cloudy, 2, 6, 14, 30—4 days.

AUG.—Clear, 1, 2, 5, 6, 7, 8, 10, 11, 14, 15, 22, 23, 27, 30, 31—15 days. Fair, 3, 4, 12, 17, 18, 19, 20, 21, 26, 28, 29—11 days. Cloudy, 9, 13, 16, 24, 25—5 days.

SEPT.—Clear, 1, 2, 8, 9, 10, 11, 12, 13, 14, 16, 17, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30—21 days. Fair, 5, 6, 7, 15, 18, 26—6 days. Cloudy, 3, 4, 19.

OCT.—Clear, 8, 10, 20, 21, 22, 23—6 days. Fair, 1, 2, 3, 4, 5, 6, 7, 17, 24, 27, 28, 29, 31—13 days. Cloudy, 9, 11, 12, 13, 14, 15, 16, 18, 19, 25, 26, 30—12 days.

NOV.—Clear, 5, 11, 12, 13, 14, 16, 19, 20, 21, 22, 23, 24—12 days. Fair, 2, 4, 6, 10, 15, 18, 25, 28—8 days. Cloudy, 1, 3, 7, 8, 9, 17, 26, 27, 29, 30—10 days.

DEC.—Clear, 7, 8, 10, 14, 15, 16, 22, 25—8 days. Fair, 5, 6, 11, 12, 13, 18, 20, 21, 23, 26, 29, 30—12 days. Cloudy, 1, 2, 3, 4, 9, 16, 17, 24, 27, 28, 31—11 days.

GRAND HAVEN.

JAN.—Sunny, 2, 3, 7, 9, 28, 29, 30, 31—8 days. Cloudy, 1, 4, 5, 6, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27—23 days.

FEB.—Sunny, 1, 6, 10, 11, 12, 13, 15, 16—8 days. Cloudy, 2, 3, 4, 5, 7, 8, 9, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28—20 days.

MARCH.—Sunny, 1, 5, 6, 7, 8, 9, 13, 22, 23, 26, 30, 31—12 days. Cloudy, 2, 3, 4, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 27, 28, 29—19 days.

APRIL.—Sunny, 1, 2, 4, 5, 7, 8, 10, 11, 14, 15, 16, 17, 19, 20, 21, 22, 24, 25, 27, 29, 30—21 days. Cloudy, 3, 6, 9, 12, 13, 18, 23, 26, 28—9 days.

MAY.—Sunny, 1, 2, 6, 7, 10, 11, 13, 14, 16, 17, 20, 23, 26, 27, 29, 30, 31—17 days. Cloudy, 3, 4, 5, 8, 9, 12, 15, 18, 19, 21, 22, 24, 25, 28—14 days.

JUNE.—Sunny, 1, 2, 4, 5, 7, 8, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30—24 days. Cloudy, 3, 6, 9, 10, 11, 20—6 days.

JULY.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31—28 days. Cloudy, 3, 12, 24.

AUG.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9. 10, 11, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31—27 days. Cloudy, 3, 12, 16, 24—4 days.

SEPT.—Sunny, 1, 2, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24. 26, 27, 28, 29, 30—24 days. Cloudy, 3, 4, 5, 7, 19, 25—6 days.

OCT.—Sunny, 2, 3, 7, 8, 17, 20, 21, 22, 23, 24—10 days. Cloudy, 1, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 25, 26, 27, 28, 29, 30, 31—21 days.

NOV.—Sunny, 5, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29—15 days. Cloudy, 1, 2, 3, 4, 6, 7, 8, 9, 10, 15, 16, 17, 25, 26, 30—15 days.

DEC—Sunny, 5, 7, 10, 13, 14, 15, 17, 18, 19, 21, 22, 25, 30—13 days. Cloudy, 1, 2, 3, 4, 6, 8, 9, 11, 12, 16, 20, 23, 24, 26, 27, 28, 29, 31—18 days.

PORT HURON.

JAN.—Cloudless, 7, 22, 24, 28—4 days. Partly cloudy, 2, 3, 4, 11, 14, 17, 21, 27, 29, 30, 31—11 days. Cloudy, 1, 5, 6, 8, 9, 10, 12, 13, 15, 16, 18, 19, 20, 23, 25, 26—16 days.

FEB.—Cloudless, 6, 10, 12, 13, 21, 22—6 days. Partly cloudy, 1, 5, 9, 11, 15, 16, 20, 24—8 days. Cloudy, 2, 3, 4, 6, 7, 8, 14, 17, 18, 19, 23, 25, 26, 27, 28—14 days.

MARCH.—Cloudless, 2, 3, 5, 7, 8, 9, 23, 31—8 days. Partly cloudy, 1, 6, 13, 14, 16, 17, 18, 21, 27, 30—10 days. Cloudy, 4, 10, 11, 12, 15, 19, 20, 22, 24, 25, 26, 28, 29—13 days.

APRIL.—Cloudless, 1, 2, 5, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22—13 days. Partly cloudy, 7, 8, 13, 14, 24, 25, 27, 28—8 days. Cloudy, 3, 4, 6, 9, 10, 23, 26, 29, 30—9 days.

MAY.—Cloudless, 2, 7, 11, 16, 17, 20, 27, 31—8 days. Partly cloudy, 1, 3, 8, 12, 14, 15, 18, 22, 23, 24, 26, 28, 29, —13 days. Cloudy, 4, 5, 6, 9, 10, 13, 19, 21, 25, 30—10 days.

JUNE.—Cloudless, 1, 2, 7, 8, 15, 16, 18, 19, 27—9 days. Partly cloudy, 4, 5, 6, 9, 11, 12, 13, 14, 17, 21, 22, 23, 24, 25, 26, 28, 29—17 days. Cloudy, 3, 10, 20, 30 - 4 days.

JULY.—Cloudless, 3, 5, 7, 8, 9, 10, 11, 13, 16, 18, 19, 20, 21, 26, 27, 28—16 days. Partly cloudy, 1, 2, 12, 14, 15, 17, 22, 23, 25, 29, 31—11 days. Cloudy, 4, 6. 24, 30—4 days.

AUG.—Cloudless, 1, 2, 5, 6, 7, 10, 11, 12, 14, 15, 27, 30, 31—13 days. Partly cloudy, 3, 8, 9, 17, 18, 20, 23, 24, 28—9 days. Cloudy, 4, 13, 16, 19, 21, 22, 25, 26, 29—9 days.

SEPT.—Cloudless, 1, 2, 3, 4, 13, 14, 18, 22, 23, 24, 28, 29—12 days. Partly cloudy, 6, 7, 10, 15, 17, 21, 25, 30—8 days. Cloudy, 5, 8, 9, 11, 12, 16, 19, 20, 26, 27—10 days.

OCT.—Cloudless, 4, 8, 17. Partly cloudy, 3, 10, 15, 21, 22, 27, 30, 31—8 days. Cloudy, 1, 2, 5, 6, 7, 9, 11, 12, 13, 14, 16, 18, 19, 20, 23, 24, 25, 26, 28, 29—20 days.

NOV.—Cloudless, 4, 5, 6, 12, 13, 14, 20, 21, 23—9 days. Partly cloudy, 3, 11, 16, 19, 22, 24, 27, 28, 29—9 days. Cloudy, 1, 2, 7, 8, 9, 10, 15, 17, 18, 25, 26, 30—12 days.

DEC.—Cloudless, 14, 15, 19, 22, 23, 24—6 days. Partly cloudy, 2, 4, 6, 8, 11, 12, 13, 20, 21, 29, 30—11 days. Cloudy, 1, 3, 5, 7, 9, 10, 16, 17, 18, 25, 26, 27, 28, 31—14 days.

THORNVILLE.

In the following statement relative to Thornville, are named for each of the months, Jan. to April, and June and July, the days of the month sunny ("all or nearly all sunshine"), and the days "all or nearly all" cloudy, and "fair," and for each of the months, May, Aug., Sept., Nov. and Dec. (the *per cent* of sunshine having been recorded for each day), the days are named clear, when the sky was three-tenths or less than three-tenths covered with clouds; fair, when the sky was from four-tenths to seven-tenths (inclusive) covered; cloudy, when the sky was more than seven-tenths covered,—as observed by J. S. Caulkins, M. D., Thornville.

JAN.—Sunny, 3, 7, 22, 24, 27, 28, 30—7 days. Cloudy, 1, 5, 6, 8, 10, 12, 13, 15, 16, 18, 19, 20, 21, 23, 25, 26, 29—17 days. Fair, 2, 4, 9, 11, 14, 17, 31—7 days.

FEB.—Sunny, 1, 6, 10, 11, 12, 13, 16, 21, 22—9 days. Cloudy, 2, 3, 4, 7, 8, 14, 18, 19, 23, 24, 25, 26, 27, 28—14 days. Fair, 5, 9, 15, 17, 20—5 days.

MARCH.—Sunny, 2, 6, 7, 8, 9, 10, 18, 21, 23, 28, 31—11 days. Cloudy, 1, 5, 11, 12, 13, 22, 25, 26, 27, 29, 30—11 days. Fair, 3, 18, 14, 15, 16, 17, 19, 20, 24—9 days.

APRIL.—Sunny, 1, 2, 5, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 24, 25, 28, 29—17 days. Cloudy, 3, 4, 9, 18, 23, 26—6 days. Fair, 6, 7, 8, 10, 14, 27, 30—7 days.

LANE LIBRARY

May.—Clear, 1, 2, 11, 14, 16, 17, 20, 23, 26—9 days. Fair, 3, 6, 8, 15, 18, 19, 22, 24, 25, 28, 29, 30, 31—13 days. Cloudy, 4, 5, 7, 9, 10, 12, 13, 21, 27—9 days.

June.—Sunny, 1, 2, 4, 5, 6, 7, 8, 9, 12, 13, 14, 16, 18, 19, 22, 23, 24, 25, 26, 27—20 days. Fair, 11, 15, 17, 20, 28, 29, 30—7 days. Cloudy, 3, 10, 21.

July.—Sunny, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31—25 days. Cloudy, 6. Fair, 1, 3, 12, 14, 24—5 days.

Aug.—Clear, 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 18, 20, 25, 26, 27, 28, 31—20 days. Fair, 3, 4, 13, 22, 24—5, days. Cloudy, 17, 19, 21, 23, 29, 30—6 days.

Sept.—Clear, 1, 2, 3, 4, 10, 14, 22, 23, 24, 25, 28, 29, 30—13 days. Fair, 5, 8, 9, 15, 17, 19, 27—7 days. Cloudy, 6. 7, 11, 12, 13, 16, 18, 20, 21, 26—10 days.

Oct.—Clear, 1, 2, 3, 5, 6, 8, 9, 10, 11, 12, 13, 15, 16, 17, 22, 25, 27, 29, 30—19 days. Fair, 23, 24, 26, 28, 31—5 days. Cloudy, 4, 7, 14, 18, 19, 20, 21—7 days.

Nov.—Clear, 5, 11, 12, 13, 14, 16, 19, 20, 21, 22, 23, 24, 27—13 days. Fair, 3, 4, 18, 27, 29, 30—6 days. Cloudy. 1, 2, 6, 7, 8, 9, 10, 15, 17, 25, 26—11 days.

Dec.—Clear, 4, 5, 6, 8, 14, 15, 19, 22, 23—9 days. Fair, 2, 9, 10, 11, 12, 20, 21, 24, 29—9 days. Cloudy, 1, 3, 7, 13, 16, 17, 18, 25, 26, 27, 28, 30, 31—13 days.

LANSING.

Jan.—Sunny, 2, 3, 4, 9, 11, 17, 22, 27, 28, 31—10 days. Cloudy, 1, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 18, 19, 20, 21, 23, 24, 25, 26, 29, 30—21 days.

Feb.—Sunny, 6, 9, 10, 11, 13, 15, 18, 20, 21, 22, 27—11 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 12, 14, 16, 17, 19, 23, 24, 25, 26, 28—17 days.

March.—Sunny, 2, 5, 6, 7, 8, 9, 13, 16, 18, 21, 22, 23, 31—13 days. Cloudy, 1, 3, 4, 10, 11, 12, 14, 15, 17, 19, 20, 24, 25, 26, 27, 28, 29, 30—18 days.

April.—Sunny, 1, 2, 5, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 27—20 days. Cloudy, 3, 4, 6, 9, 10, 23, 26, 28, 29, 30—10 days.

May.—Sunny, 1, 2, 3, 11, 14, 15, 17, 18, 23, 25, 26, 27, 28, 29, 30—15 days. Cloudy, 4, 5, 6, 7, 8, 9, 10, 12, 13, 16, 19, 20, 21, 22, 24, 31—16 days.

June.—Sunny, 1, 2, 4, 5, 7, 8, 13, 16, 18, 19, 22, 25, 26, 27, 28—15 days. Cloudy, 3, 6, 9, 10, 11, 12, 14, 15, 17, 20, 21, 23, 24, 29, 30—15 days.

July.—Sunny, 3, 4, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17, 18, 19, 20, 21, 22, 25, 27, 28—20 days. Cloudy, 1, 2, 5, 12, 14, 23, 24, 26, 29, 30, 31—11 days.

Aug.—Sunny, 1, 2, 3, 5, 6, 7, 8, 10, 11, 14, 15, 16, 20, 21, 23, 31—16 days. Cloudy, 4, 9, 12, 13, 17, 18, 19, 22, 24, 25, 26, 27, 28, 29, 30—15 days.

Sept.—Sunny, 1, 2, 3, 13, 14, 15, 18, 21, 22, 23, 24, 28, 29—13 days. Cloudy, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 17, 19, 20, 25, 26, 27, 30—17 days.

Oct.—Sunny, 1, 3, 7, 8, 10, 15, 17, 19, 21, 22, 24—11 days. Cloudy, 2, 4, 5, 6, 9, 11, 12, 13, 14, 16, 18, 20, 23, 25 26, 27, 28, 29, 30, 31—20 days.

Nov.—Sunny, 5, 6, 11, 12, 13, 14, 18, 19, 20, 21, 23, 24, 28, 29—14 days. Cloudy, 1, 2, 3, 4, 7, 8, 9, 10, 15, 16, 17, 22, 25, 26, 27, 30—16 days.

Dec.—Sunny, 5, 6, 8, 10, 14, 15, 18, 19, 21, 22, 29—11 days. Cloudy, 1, 2, 3, 4, 7, 9, 11, 12, 13, 16, 17, 20, 23, 24, 25, 26, 27, 28, 30, 31—20 days.

ALBION.

Jan.—Sunny, 3, 28. Fair, 2, 7, 8, 9, 11, 14, 17, 18, 21, 22, 24, 27—12 days. Cloudy, 1, 4, 5, 6, 10, 12, 13, 15, 16, 19, 20, 23, 25, 26, 29, 30, 31—17 days.

Feb.—Sunny, 6, 10, 11, 15—4 days. Fair, 1, 5, 9, 12, 13, 16, 18, 20, 21, 22, 23—11 days. Cloudy, 2, 3, 4, 7, 8 14, 17, 19, 24, 25, 26, 27, 28—13 days.

March.—Sunny, 5, 6, 8, 21—4 days. Fair, 1, 2, 3, 4, 7, 9, 13, 15, 17, 18, 19, 22, 23, 25, 26, 30, 31—17 days. Cloudy, 10, 11, 12, 14, 16, 20, 24, 27, 28, 29—10 days.

April.—Sunny, 1, 2, 5, 11, 15, 16, 17, 18, 19, 20, 21, 27—12 days. Fair, 3, 7, 12, 13, 14, 22, 24, 25, 28, 30—10 days. Cloudy, 4, 6, 8, 9, 10, 23, 26, 29—8 days.

May.—Sunny, 2, 11, 16, 17, 28, 29—6 days. Fair, 1, 3, 7, 14, 15, 18, 20, 23, 24, 25, 26, 27, 30, 31—14 days. Cloudy, 4, 5, 6, 8, 9, 10, 12, 13, 19, 21, 22—11 days.

June.—Sunny, 1, 2, 5, 7, 8, 19, 24, 26, 27, 28—10 days. Fair, 4, 6, 10, 11, 12, 13, 15, 16, 17, 18, 22, 23, 25, 29, 30—15 days. Cloudy, 3, 9, 14, 20, 21—5 days.

July.—Sunny, 1, 4, 5, 7, 8, 9, 10, 11, 16, 17, 18, 19, 21, 27—14 days. Fair, 2, 3, 6, 13, 14, 20, 22, 23, 24, 25, 26, 28, 29, 30, 31—15 days, Cloudy, 12, 15.

Aug.—Sunny, 1, 2, 5, 6, 10, 11, 15, 23, 30, 31—10 days. Fair, 3, 7, 8, 9, 14, 17, 18, 21, 22, 25, 26, 27, 28, 29—14 days. Cloudy, 4, 12, 13, 16, 19, 20, 24—7 days.

SEPT.—Sunny, 1, 14, 22, 23, 28—5 days. Fair, 2, 3, 4, 6, 7, 10, 12, 13, 17, 18, 20, 27, 29—13 days. Cloudy, 5, 8, 9, 11, 15, 16, 19, 21, 24, 25, 26, 30—12 days.

OCT.—Sunny, 3, 17, 21. Fair, 5, 7, 8, 9, 14, 15, 16, 19, 20, 24—10 days. Cloudy, 1, 2, 4, 6, 10, 11, 12, 13, 18, 22, 23, 25, 26, 27, 28, 29, 30, 31—18 days.

NOV.—Sunny, 12, 13, 19, 20—4 days. Fair, 4, 10, 11, 18, 21, 24, 27, 28—8 days. Cloudy, 1, 2, 3, 5, 6, 7, 8, 9, 14, 15, 16, 17, 22, 23, 25, 26, 29, 30—18 days.

DEC.—Sunny, 30. Fair, 1, 5, 6, 8, 10, 11, 13, 14, 17, 18, 19, 21, 22, 27, 29—15 days. Cloudy, 2, 3, 4, 7, 9, 12, 15, 16, 20, 23, 24, 25, 26, 28, 31—15 days.

ANN ARBOR.

JAN.—Sunny, 3, 11, 17, 22, 27, 28, 31—7 days. Cloudy, 1, 2, 5, 6, 7, 8, 10, 12, 14, 15, 19, 20, 23, 25, 26, 29—16 days.*

FEB.—Sunny, 6, 8, 10, 11, 13, 15, 16, 21—8 days. Cloudy, 2, 3, 4, 5, 7, 14, 17, 18, 19, 23, 25, 26, 27, 28—14 days.*

MARCH.—Sunny, 5, 6, 7, 8, 9, 23—6 days. Cloudy 1, 10, 11, 12, 15, 18, 22, 25, 26, 27, 28, 29—12 days.*

APRIL.—Sunny, 1, 2, 5, 11, 13, 15, 17, 18, 19, 20, 21, 25, 27, 28—14 days. Cloudy, 3, 4, 8, 10, 22, 23, 29, 30—8 days.*

MAY.—Sunny, 1, 2, 11, 16, 17, 23, 27, 29, 30, 31—10 days. Cloudy, 5, 7, 9, 10, 12, 19, 20, 21, 24—9 days.*

JUNE.—Sunny, 1, 2, 4, 7, 8, 12, 13, 14, 18, 19, 23, 25, 26, 27—14 days. Cloudy, 9, 11, 17, 20, 21, 29—6 days.*

JULY.—Sunny, 5, 7, 8, 9, 10, 11, 16, 19, 20, 21—10 days. Cloudy, 2, 3, 6, 12, 14, 23, 30—7 days.*

AUG.—Sunny, 6, 10, 11, 31—4 days. Cloudy, 2, 3, 4, 13, 17, 24, 25, 26, 29, 30—10 days.*

SEPT.—Sunny, 1, 22, 23, 24, 28, 29—6 days. Cloudy, 4, 5, 7, 8, 9, 10, 11, 12, 16, 17, 19, 20, 21, 25, 26, 27, 30—17 days.*

OCT.—Sunny, 17. Cloudy, 1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 31—25 days.*

NOV.—Sunny, 5, 12, 13, 19, 28—5 days. Cloudy, 1, 7, 8, 9, 10, 15, 16, 17, 26, 30—10 days.*

DEC.—Sunny, 14, 15, 19. Cloudy, 1, 2, 3, 4, 9, 16, 17, 20, 24, 25, 26, 27, 28, 30, 31—15 days.*

OTSEGO.

APRIL.—Clear, 1, 2, 5, 7, 11, 12, 15, 16, 17, 19, 20, 21, 22, 24, 27, 28—16 days. Fair, 4, 8, 14, 18, 23, 25, 29—7 days. Cloudy, 3, 6, 9, 10, 13, 26, 30—7 days.

MAY.—Clear, 1, 2, 11, 14, 17, 26, 29, 30—8 days. Fair, 3, 6, 7, 16, 18, 20, 23, 25, 27, 28, 31—11 days. Cloudy, 4, 5, 8, 9, 10, 12, 13, 15, 19, 21, 22, 24—12 days.

JUNE.—Clear, 1, 2, 5, 8, 13, 16, 19, 22, 23, 24, 25, 26, 27, 28, 29—15 days. Fair, 3, 6, 7, 11, 12, 15, 18, 21, 30—9 days. Cloudy, 4, 9, 10, 14, 17, 20—6 days.

JULY.—Clear, 1, 4, 5, 7, 8, 9, 10, 11, 13, 16, 18, 19, 20, 21, 22, 26, 27, 28, 29, 30, 31—21 days. Fair, 2, 3, 6, 15, 17, 24, 25—7 days. Cloudy, 12, 14, 23.

AUG.—Clear, 1, 2, 5, 6, 9, 10, 11, 15, 16, 18, 22, 31—12 days. Fair, 4, 7, 8, 14, 17, 21. 23, 27. 28, 29, 30—11 days. Cloudy, 3, 12, 13, 19, 20, 24, 25, 26—8 days.

SEPT.—Clear, 1, 10, 14, 17, 22, 23, 27, 28—8 days. Fair, 2, 3, 6, 8, 9, 13, 16, 18, 20, 21, 24, 29—12 days. Cloudy 4, 5, 7, 11, 12, 15, 19, 25, 26, 30—10 days.

OCT.—Clear, 3, 17, 19, 22—4 days. Fair, 1. 8, 15, 20, 21—5 days. Cloudy, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31—22 days.

KALAMAZOO.

JAN.—Sunny, 2, 3, 9, 11, 17, 18, 27, 28, 31—9 days. Cloudy, 1, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 29, 30—22 days.

FEB.—Sunny, 6, 10, 11, 13, 15—5 days. Cloudy, 1, 2, 3, 4, 5, 7, 8, 9, 12, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28—23 days.

MARCH.—Sunny. 1, 5, 6, 7, 8, 9, 13—7 days. Fair, 14, 18, 19, 21, 22, 23, 30, 31—8 days. Cloudy, 2, 3, 4, 10, 11, 12, 15, 16, 17, 20, 24, 25, 26, 27, 28, 29—16 days.

APRIL.—Sunny, 1, 2, 5, 7, 11, 15, 16, 17, 19, 20, 21, 22, 24, 25, 27—15 days. Fair, 12, 13, 14, 18, 28—5 days. Cloudy, 3, 4, 6, 8, 9, 10, 23, 26, 29, 30—10 days.

MAY.—Sunny, 1, 2, 11, 16, 17, 25, 27, 29—8 days. Fair, 3, 6, 14, 20, 23, 28, 30—7 days. Cloudy, 4, 5, 7, 8, 9, 10, 12, 13, 15, 18, 19, 21, 22, 24, 26, 31—16 days.

JUNE.—Sunny, 1, 2, 5, 7, 8, 16, 18, 19, 23, 25, 26, 27, 28—13 days. Fair, 4, 12, 13, 14, 17, 22, 24, 29—8 days. Cloudy, 3, 6, 9, 10, 11, 15, 20, 21, 30—9 days.

JULY.—Sunny, 3, 4, 5, 7, 8, 9, 10, 11, 16, 19, 21, 22, 26, 28, 30, 31—16 days. Fair, 1, 6, 17, 18, 20, 24, 25, 27, 29—9 days. Cloudy, 2, 12, 13, 14, 15, 23—6 days.

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* No record for the rest of the month.

AUG.—Sunny, 1, 5, 6, 7, 10, 11, 15, 31—8 days. Fair, 2, 9, 14, 16, 23, 25, 26, 27, 28, 30—10 days. Cloudy, 3, 4, 8, 12, 13, 17, 18, 19, 20, 21, 22, 24, 29—13 days.

SEPT.—Sunny, 1, 2, 10, 23, 24, 28, 29—7 days. Fair, 3, 4, 6, 13, 14, 17, 18, 20, 21, 22, 30—11 days. Cloudy, 5, 7, 8, 9, 11, 12, 15, 16, 19, 25, 26, 27—12 days.

OCT.—Sunny, 17, 21. Fair, 3, 7, 15, 20, 22—5 days. Cloudy, 1, 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 23, 24, 25, 26, 27, 28, 29, 30, 31—24 days.

NOV.—Sunny, 5, 12, 13, 19, 20, 22, 24, 28—8 days. Fair, 4, 6, 10, 14, 18, 21, 23, 25, 29—9 days. Cloudy, 1, 2, 3, 7, 8, 9, 11, 15, 16, 17, 26, 27, 30—13 days.

DEC.—Sunny, 5, 8, 14, 18, 19, 30—6 days. Fair, 7, 10, 13, 15, 17, 20, 23, 25, 29—9 days. Cloudy, 1, 2, 3, 4, 6, 9, 11, 12, 16, 21, 22, 24, 26, 27, 28, 31—16 days.

MARSHALL.

JAN.—Fair, 2, 3, 7, 17, 18, 22, 24, 27, 28, 31—10 days. Cloudy, 1, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 23, 25, 26, 29, 30—21 days.

FEB.—Fair, 1, 5, 6, 9, 10, 11, 12, 13, 15, 16, 18, 21, 22—13 days. Cloudy, 2, 3, 4, 7, 8, 14, 17, 19, 20, 23, 24, 25, 26, 27, 28—15 days.

MARCH.—Fair, 2, 3, 4, 5, 6, 7, 8, 9, 15, 16, 18, 19, 21, 22, 23, 30, 31—17 days. Cloudy, 1, 10, 11, 12, 13, 14, 17, 20, 24, 25, 26, 27, 28, 29—14 days.

APRIL.—Sunny, 1, 2. Fair, 5, 7, 8, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 27, 28, 29—19 days. Cloudy, 3, 4, 6, 9, 10, 13, 23, 26, 30—9 days.

MAY.—Fair, 1, 2, 3, 7, 11, 14, 16, 17, 18, 23, 26, 27, 28, 29, 30—15 days. Cloudy, 4, 5, 6, 8, 9, 10, 12, 13, 15, 19, 20, 21, 22, 24, 25, 31—16 days.

JUNE.—Sunny, 1, 2. Fair, 4, 5, 7, 8, 12, 13, 15, 16, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29—18 days. Cloudy, 3, 6, 9, 10, 11, 14, 17, 20, 21, 30—10 days.

EXHIBIT 28.—*Dates of Solar and Lunar Halos.*

Line Number.	Stations.	Dates of Halos Recorded.									
		January.		February.		March.		April.		May.	
		Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.
1	Gulliver Lake		29, 30		1		4, 28	5, 12	5	19, 29	
2	Traverse City								5,26,29		
3	Alpena		6, 30		3	27	1, 2, 3	26	5, 25, 26, 29	2	
4	G'd Haven							28	1, 25, 26, 29		
5	Port Austin	24, 30	30						25		
6	Thornville		30, 31								
7	Lansing, S. B. of H.	4, 25	2, 6, 31	1,5,10, 16, 19, 24, 27	4, 21	16, 18, 27, 29, 30, 31	23, 24, 28, 30	1,10,11, 18,21,24, 25,28	1, 2, 4	3, 8, 14, 19,21,25, 29, 30	28, 30
8	Otsego				4		8, 28, 30				
9	Albion		6, 31					12, 15	25, 28	12, 15, 17	
10	Ann Arbor										
11	Hudson				6	3					
12	Kalamazoo						28, 30				
13	Birmingham					31					

Parhelia, Feb. 15, 22, 25; March 3, 31; April 14; Nov. 16, 23; Dec. 31.—*Lansing.*
Parhelia, March 31.—*Kalamazoo*; March 31.—*Birmingham*; March 2, 3, 4.—*Gulliver Lake.*
Corona, Feb. 24; April 1, 2, 4, 5, 21, 24, 25, 29; May 30; June 26, 28, 29, 30; Sept. 25, 26; Oct. 22; Nov. 18, 20, 21, 23, 24; Dec. 8, 15, 22, 25.—*Lansing.*
Lunar corona, March 28, 30.—*Albion.*

JULY.—Fair, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31—29 days. Cloudy, 12, 25.

AUG.—Clear, 1, 2, 3, 5, 6, 7, 8, 9, 10, 11—10 days. Fair, 14, 15, 16, 18, 22, 23, 27, 28, 29, 30, 31—11 days. Cloudy. 4, 12, 13, 17, 19, 20, 21, 24, 25, 26—10 days.

SEPT.—Sunny, 1, 2, 3. Fair, 9, 10, 13, 14, 15, 17, 18, 20, 21, 22, 23, 24, 28, 29, 30—15 days. Cloudy, 4, 5, 6, 7, 8, 11, 12, 16, 19, 25, 26, 27—12 days.

OCT.—Fair, 3, 8, 9, 10, 15, 17, 20, 21, 22—9 days. Cloudy, 1, 2, 4, 5, 6, 7, 11, 12, 13, 14, 16, 18, 19, 23, 24, 25, 26, 27, 28, 29, 30, 31—22 days.

NOV.—Fair, 4, 5, 6, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 28, 29—16 days. Cloudy, 1, 2, 3, 7, 8, 9, 10, 15, 16, 17, 25, 26, 27, 30—14 days.

DEC.—Fair, 8, 10, 14, 15, 18, 19, 21, 22, 29, 30—10 days. Cloudy, 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 16, 17, 20, 23, 24, 25, 26, 27, 28, 31—21 days.

DETROIT.

JAN.—Cloudless, 3, 28. Partly cloudy, 22. Cloudy, 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 21, 23, 24, 25, 26, 27, 29, 30, 31—28 days.

FEB.—Cloudless, 10, 11, 13, 15, 16—5 days. Partly cloudy, 6, 8, 12, 18, 20, 21, 22, 24—8 days. Cloudy, 1, 2 3, 4, 5, 7, 9, 14, 17, 19, 23, 25, 26, 27, 28—15 days.

MARCH.—Cloudless, 8, 9, 21, 23—4 days. Partly cloudy, 2, 3, 5, 6, 7, 13, 14, 18, 19, 25, 26, 30, 31—13 days. Cloudy, 1, 4, 10, 11, 12, 15, 16, 17, 20, 22, 24, 27, 28, 29—14 days.

APRIL.—Cloudless, 1, 2, 5, 16, 17, 18, 19, 20, 21, 22—10 days. Cloudy, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 23, 24, 25, 26, 27, 28, 29, 30—20 days.

NOV.—Cloudless, 5, 6, 11, 12, 13, 14, 19—7 days. Partly cloudy, 21, 28, 29—3 days. Cloudy, 1, 2, 3, 4, 7 8, 9, 10, 15, 16, 17, 18, 20, 22, 23, 24, 25, 26, 27, 30—20 days.

Recorded on the Monthly Registers in 1890.

Months, 1890.														
June.		July.		August.		September.		October.		November.		December.		Line Number.
Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	Solar.	Lunar.	
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9	--------	----------	----	----	----	----------	--------	----	--------	----	----------	----	----------	5
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9, 16, 19, 20, 25, 30	3, 4, 25	9, 10, 11, 16	----	12	25	9, 10, 18, 24	21, 24, 26	8, 9	22, 27, 28	9	21, 23, 24, 27	15	15, 22, 24, 25, 27	7
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8	--------	----------	----	----	----	----------	--------	----	--------	----	----------	----	6	12
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EXHIBIT 29.—*Inches of Rain and Melted Snow by Year and Months, in 1890, compared with Annual and Monthly Averages for 1889, and for the Thirteen Years, 1877–89. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89*	35.33	2.17	2.59	2.30	2.46	3.42	3.96	3.36	3.15	3.33	3.28	3.10	2.72
1889 (17 stations)	28.18	2.42	2.04	1.01	1.62	4.21	3.82	3.07	0.98	1.85	1.10	3.10	2.96
1890 (20 stations)	30.20	3.53	2.40	2.12	3.37	4.80	3.74	1.47	3.63	2.09	4.97	2.43	1.70
In 1890 Greater than Av. for 13 years, 1877-89		1.36			.91	1.38			.48		1.69		
In 1890 Less than Av. for 13 years, 1877-89	5.13		.19	.18			.22	1.89		1.24		.67	1.02
In 1890 Greater than in 1889	2.02	1.11	.36	1.11	1.75	.59			2.65	.24	3.87		
In 1890 Less than in 1889							.08	1.60				.67	1.26

* Benton Harbor for 1877-78; Mendon for 1877-78, 1880-82; Tecumseh for 1877-78, 1880-85; Niles for 1878-81; Nirvana for 1877-79, and to, and including April 25, 1880; Coldwater, Woodmere Cemetery for 1877-79; Otisville for 1878-80, 1882; Escanaba for 1880-87; Washington for 1880-83; Fife Lake, Ypsilanti for 1887; Reed City from April 26 to December 31 inclusive in 1880 and for 1881-85; Winfield for 1881-3; Hudson and Mallory Lake for 1881, 1886; Hastings for 1882; Hillsdale for 1882-84; Ionia for 1883-84; Manistique for 1884-85; Mackinaw City for 1884-87; Swartz Creek for 1884-85; Pentwater, East Saginaw for 1886; Thornville, Kalamazoo, Detroit for 1877-89; Agricultural College for 1877-78, 1881-89; Marquette for 1879-84, 1886-89; Alpena, Port Huron for 1879-89; Grand Haven for 1879-88; Battle Creek for 1877-78, 1884, 1888; Lansing for 1880-89; Harrisville for 1881-82, 1887-89; Ann Arbor for 1881-82, 1885-86, 1888-89; Marshall for 1881-84, 1886-89; Traverse City for 1882-89; Parkville for 1882-83, 1885-89; Gulliver Lake, Birmingham for 1887-89; Manistee for 1889; Hudson for 1888-89.

EXHIBIT 30.—*Comparison of the Rainfall during the Year and during each Month of the Year 1890, with that for the Year 1889, and with the Average for the 26 Years, 1864-89. Observations made by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Inches of Rain and Melted Snow.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 26 years, 1864-89.	31.69	1.85	2.05	2.48	2.35	3.12	4.11	3.34	2.69	2.96	2.53	2.28	1.96
1889	24.08	1.53	1.17	1.22	2.02	3.61	3.72	3.41	0.68	0.79	0.65	2.67	2.61
1890	31.92	2.31	1.79	1.54	3.20	4.98	3.92	0.92	3.60	1.67	4.57	2.30	1.12
In 1890 Greater than Av. for 26 years, 1864-89	.23	.46			.85	1.86			.91		2.04	.02	
In 1890 Less than Av. for 26 years, 1864-89			.26	.94			.19	2.42		1.29			.84
In 1890 Greater than in 1889	7.84	.78	.62	.32	1.18	1.37	.20		2.92	.88	3.92		
In 1890 Less than in 1889								2.49				.37	1.49

TABLE VII.—*Inches of Rain and Melted Snow for the Year, and for each Month of the year 1890, at 20 Stations in Michigan,—as compiled from Daily Observations made by Observers* for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.* (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Inches of Rain and Melted Snow.													
		Year.		Months, 1890.											
		Norm. ‡	1890.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 20 Stations §	....	......	30.20	3.53	2.40	2.12	3.37	4.80	3.74	1.47	3.63	2,09	4.97	2.43	1.70
Marquette	U. P.	31.03	34.47	3.11	5.17	2.20	1.67	2.96	3.66	4.07	2.17	1.52	3.18	1.94	2.82
Gulliver Lake	U. P.	36.57^{4}	34.74	4.33	2.95	2.78	1.39	3.79	5.36	3.77	3.21	2.69	1.54	1.45	1.48
Manistee	N. W.	32.96^{2}	36.25	5.64	2.55	2.64	3.93	3.17	3.03	2.84	2.69	1.12	5.59	2.53	1.02
Traverse City	N. W.	39.08^{9}	33.95	4.77	3.00	2.01	2.58	1.96	1.86	3.12	3.98	1.42	4.48	2.73	2.04
Alpena	N. E.	36.61^{18}	31.35	3.77	2.23	2.07	4.20	3.74	1.83	2.54	3.11	0.97	3.03	2.18	1.68
Harrisville	N. E.	30.42^{4}	30.20	2.80	1.92	1.87	3.99	3.64	2.68	1.79	3.20	0.84	2.84	2.11	2.52
Grand Haven	W.	......	32.26	2.83	2.29	2.98	3.07	5.32	3.11	0.90	2.78	1.72	4.12	1.91	1.23
Port Huron	B. & E.	32.08^{16}	32.95	3.11	1.76	1.43	2.46	4.30	4.72	0.96	4.33	1.23	4.92	2.42	1.31
Thornville	B. & E.	33.38^{14}	39.86	3.38	1.73	1.98	3.35	5.86	3.43	1.10	4.56	2.43	7.90	2.70	1.49
Alma	C.	......	33.63	3.52	4.24	1.71	2.64	6.29	3.41	0.94	2.26	0.61	5.76	1.44	0.81
Agricultural College	C.	31.70^{27}	31.92	2.31	1.79	1.54	3.20	4.98	3.92	0.92	3.60	1.67	4.57	2.30	1.12
Lansing, S. B. of H.	C.	34.22^{11}	33.96	2.71	1.85	1.81	3.23	6.22	4.08	0.52	3.06	2.39	4.96	2.91	0.77
Otsego	S. W.	......	41.47	2.63	2.79	2.61	5.02	5.34	6.30	0.04	2.84	2.60	5.23	3.12	2.95
Albion	S. C.	......	43.19	4.53	2.26	3.40	4.93	5.79	4.84	0.38	4.06	2.85	5.59	2.55	2.06
Ann Arbor	S. C.	29.44^{3}	37.05	3.11	1.95	1.69	3.90	5.19	3.34	0.93	4.86	1.56	5.26	2.95	2.31
Hudson	S. C.	......	‖	4.06	2.12	1.97	1.80	4.78	3.57	0.63	4.11	3.07	5.87	2.77	.....
Kalamazoo	S. C.	37.18^{14}	35.94	3.45	1.53	1.96	3.40	4.66	3.77	1.14	2.81	5.03	4.32	2.52	1.35
Marshall	S. C.	33.07^{5}	40.30	3.14	1.62	2.24	4.66	5.62	3.85	0.63	5.02	3.26	6.03	2.70	1.53
Parkville	S. C.	45.27^{10}	47.81	5.09	2.54	2.92	4.90	6.58	5.22	0.43	3.90	3.59	7.16	2.36	3.12
Tecumseh	S. C.	......	¶	.....	.....	.....	3.89	4.75	1.73	1.50	3.62	2.06	.....	.....	.....
Birmingham	S. E.	29.49^{4}	38.47	3.74	1.88	1.78	2.22	6.54	2.16	1.14	5.62	2.03	7.18	3.08	1.10
Detroit	S. E.	33.19^{19}	34.99	2.70	2.01	1.32	2.74	3.94	4.28	1.69	4.46	2.31	5.67	2.64	1.23

* The names of observers, their places of observation, and the counties in which these places are situated are stated in Exhibit 1, page 2.

† The names of divisions, and the counties in each, are stated in Exhibit I, in a paper which follows on weekly reports of sickness.

‡ Numbers in this column state the average annual rainfall for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the rainfall, denote the number of years included in the average.

§ This line is an average for only the stations from which statements, nearly complete, are given for every month of the year. It does not include Hudson and Tecumseh.

‖ The total rainfall for 11 months is 34.75 inches. ¶ For 6 months, 17.57 inches.

NOTE.—The computations of amount of rainfall were furnished by the observers at Detroit, Alpena, Grand Haven, Port Huron, Ann Arbor, Manistee, Albion, Kalamazoo and Marquette for the year. All other computations in Table VII. were made in the office of the Secretary of the State Board of Health.

The lines for 8 representative stations in Table VII. are graphically represented in Diagram VII., page 56.

DIAGRAM VII.—RAINFALL, BY MONTHS IN 1890.

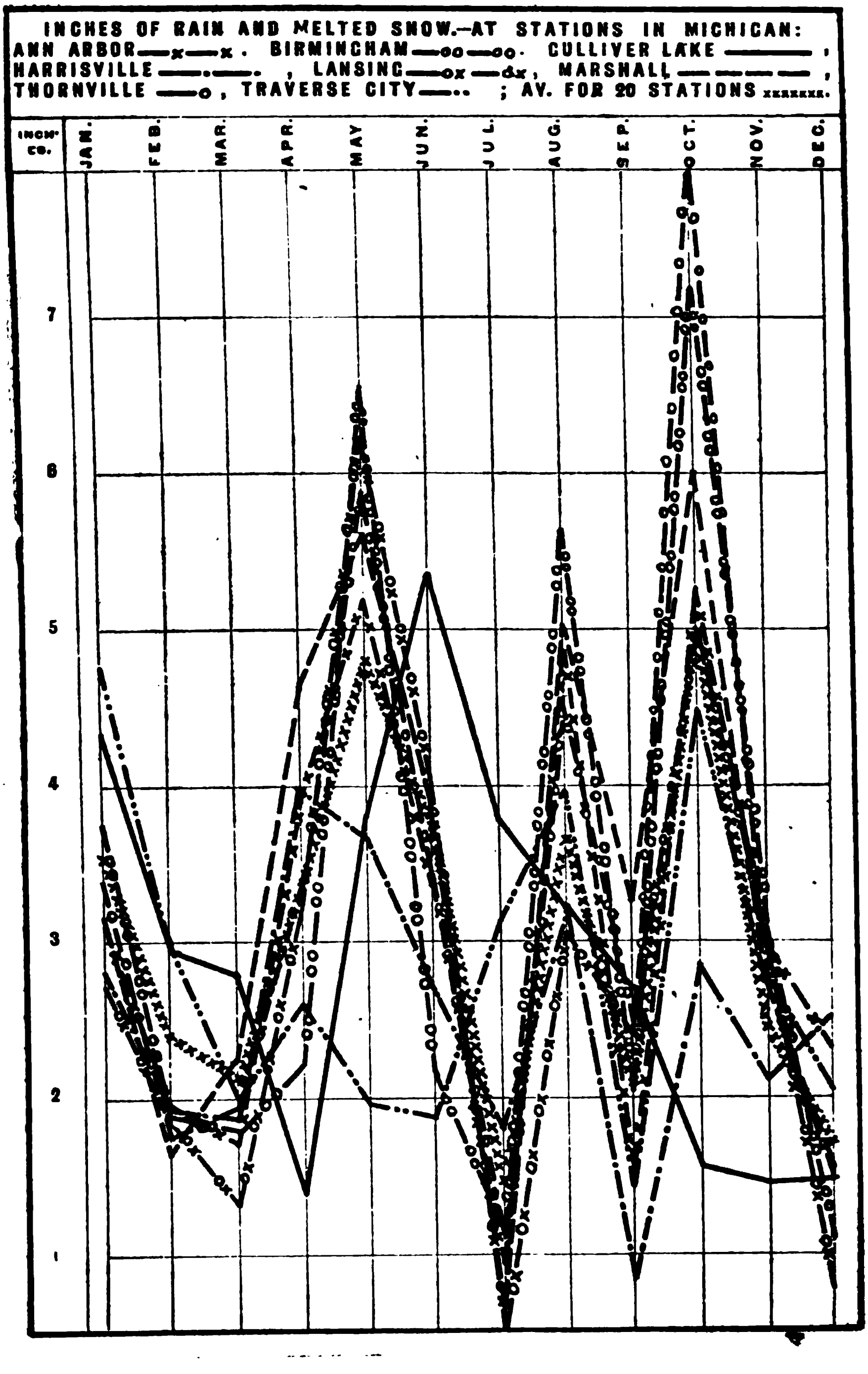

EXHIBIT 31.—*Average Amount of Atmospheric Ozone (Day), by Year and Months, in 1890, compared with Annual and Monthly Averages for 1889, and for the 13 years, 1877-89. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Ozone by Day.—Degree of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89*	3.26	3.43	3.54	3.56	3.43	3.40	3.23	2.86	3.07	3.02	3.03	3.15	3.38
1889 (8 Stations)	3.98	4.31	4.15	3.95	3.91	4.19	4.61	3.80	3.93	3.97	3.54	3.62	3.83
1890 (8 Stations)	3.69	3.99	3.97	4.19	4.08	4.65	4.13	3.23	3.49	3.44	3.09	2.53	3.49
In 1890 Greater than Av. for 13 years, 1877-89	0.43	0.56	0.43	0.63	0.65	1.25	0.90	0.37	0.42	0.42	0.06	......	0.11
In 1890 Less than Av. for 13 years, 1877-89	......	......	......	......	......	......	......	......	......	......	......	0.62	......
In 1890 Greater than in 1889	......	......	......	0.24	0.17	0.46	......	......	......	......	......	......	......
In 1890 Less than in 1889	0.29	0.32	0.18	......	......	......	0.48	0.57	0.44	0.53	0.45	1.09	0.34

* Tecumseh for 1877-85; Mendon for 1877-83; Niles for 1878-81; Nirvana for 1877-79 and to and including April 25, 1880; Coldwater, Agricultural College for 1877-78, 1880; Otisville for 1878-80, 1882; Washington for 1879-83; Petoskey, Woodmere Cemetery for 1878-79; Fife Lake, Ypsilanti for 1877; Ionia for 1880, 83-84; Adrian for 1880; Hudson and Mallory Lake for 1881; Reed City for April 26 to end of year 1880 and for 1881-85; Hastings for 1882; Hillsdale for 1882-84; Parkville for 1882; Port Austin for 1883-85, 1888-89; Winfield for 1883; Manistique, Mackinaw City, Swartz Creek for 1884-85; Pentwater for 1886; Kalamazoo for 1877-88; Alpena for 1879-87; Marquette for 1880-81, 1883-84, 1886-87; Grand Haven for 1880-84; Escanaba for 1881-85, 1887; Port Huron for 1881-85; Thornville for 1877-89; Lansing for 1879-89; Ann Arbor for 1880-89; Harrisville for 1881-82, 1885-89; Marshall for 1881-89; Traverse City for 1882-89; Birmingham for 1886-89; Battle Creek for 1877-80, 1882-84.

† In this exhibit allowance has been made for difference in sensitiveness of test-paper.

EXHIBIT 32.—*Average Amount of Atmospheric Ozone (Night), by Year and Months, in 1890, compared with Annual and Monthly Averages for 1889, and for the 13 Years, 1877-89. These Averages are for Groups of Several Stations in Michigan.**

Years, etc.	Ozone by Night.—Degree of Coloration of Test-paper.†												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89*	3.39	3.89	4.06	4.65	3.72	3.57	3.30	2.72	2.74	2.79	3.14	3.36	3.70
1889 (8 Stations)	4.05	3.89	4.29	4.15	4.30	4.51	5.00	3.97	4.03	3.70	3.29	3.36	4.05
1890 (8 Stations)	3.83	3.91	4.57	4.49	4.47	4.83	4.19	3.39	3.51	3.14	3.09	2.63	3.71
In 1890 Greater than Av. for 13 years, 1877-89	0.44	0.02	0.51	0.44	0.75	1.26	0.89	0.67	0.77	0.35	......	......	0.01
In 1890 Less than Av. for 13 years, 1877-89	......	......	......	......	......	......	......	......	......	......	0.05	0.73	......
In 1890 Greater than in 1889	......	0.02	0.28	0.34	0.17	0.32	......	......	......	......	......	......	......
In 1890 Less than in 1889	0.22	......	......	......	......	......	0.81	0.58	0.52	0.56	0.20	0.73	1.34

* The stations represented in Exhibit 32, are the same as those represented in Exhibit 31, relative to day ozone, and named in foot-note of that exhibit.

† In this exhibit allowance has been made for the sensitiveness of test-paper.

OBSERVATIONS FOR OZONE AT LANSING.

Since July 1, 1884, the observations for ozone at Lansing have been taken at the new shelter for meteorological instruments in the southwest part of the Capitol yard. Previous to July 1, 1884, the observations had been taken at the office window. Exhibit E, page 60, of the Report for 1885, shows that the average for the month of July, 1884, is greater at each observation—7 A. M. to 2 P. M., 2 P. M. to 9 P. M., and 9 P. M. to 7 A. M. at the shelter for instruments than at the office window. Possibly this fact should be taken into consideration in studying Ozone at Lansing through a long period of years.

TABLE VIII.—*Relative Amount of Ozone in the Atmosphere, by Day, during the Year and during each month of the Year 1890, at 12 Stations, also average lines for 8 Stations and for 4 Stations in Michigan, as indicated by Averages of Observations made Daily by exposing Test-paper prepared according to Schönbein's formula, from 7 A. M. to 2 P. M.—Recorded according to a scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10) by observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.†	Degrees of Coloration of Test-paper—Day Observations.**													
		Year.		Months, 1890.											
		Norm. ‡	1890.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 Stations§.	......	......	3.69	3.99	3.97	4.19	4.08	4.65	4.13	3.23	3.49	3.44	3.09	2.58	3.49
Av. for 4 Stations	......	......	3.49	3.79	3.55	3.50	3.24	4.08	4.02	3.54	3.52	3.17	3.31	2.73	3.39
Marquette	U. P.	......	*	6.74	......	6.64	5.79	5.45	5.22	4.08	5.73	2.98	4.68	4.39	4.80
Gulliver Lake	U. P.	......	††	[b] 5.91	[d] 3.61	5.83	3.72	3.29	3.06	2.37	......	......	......	......	......
Manistee	N. W.	......	‡‡	6.09	4.41	......	6.19	5.71	5.46	4.18	[a] 3.95	3.45	3.82	4.39	......
Traverse City	N. W.	3.99^{6}	6.19	5.90	6.02	6.71	6.86	[a] 7.12	7.49	6.12	6.09	5.78	4.48	5.26	6.44
Alpena	N. E.	......	4.27	1.48	4.91	4.54	3.06	3.06	3.99	3.76	3.99	3.75	5.85	4.23	5.64
Harrisville	N. E.	4.40^{6}	4.62	5.32	5.20	4.57	5.19	4.80	4.72	4.18	4.15	4.15	4.98	3.79	4.44
Grand Haven	W.	......	3.93	4.60	3.79	3.69	4.39	5.82	5.39	4.09	4.22	3.35	2.68	2.46	2.72
Port Austin	B. & E.	......	§§	4.09	[e] 4.17	[a] 3.99	[b] 3.68	[c] 4.25	[b] 3.95	[a] 2.52	[h] 3.44	......	......	......	......
Port Huron	B. & E.	......	3.02	2.87	2.91	2.80	2.89	4.00	3.69	3.76	3.16	2.88	2.27	2.26	2.73
Thornville	B. & E.	2.82^{11}	3.49	4.38	4.59	3.80	3.79	4.03	2.89	2.12	2.70	3.32	3.46	3.06	3.73
Alma	C.	......		5.74	5.20	4.80	3.82	3.93	[f] 3.38	......	......	[g] 3.10	3.43	4.48	[h] 5.33
Lansing, S. B. of H.	C.	3.33^{12}	3.77	3.58	3.38	4.35	4.52	5.93	4.42	4.15	3.57	3.02	3.37	2.13	2.83
Otsego	S. W.	......	2.21	3.06	2.55	2.35	1.86	2.16	2.06	2.08	2.51	2.22	2.08	1.43	2.15
Albion	S. C.	......	3.64	4.42	4.09	5.28	4.56	5.61	4.32	2.83	3.12	2.78	1.98	1.83	2.83
Ann Arbor	S. C.	2.96^{11}	3.07	[e] 2.67	3.59	3.93	3.36	4.06	3.99	2.50	3.02	3.35	2.08	1.33	2.93
Battle Creek	S. C.	......	¶*	1.32	1.52	1.67	1.56	1.84	1.96	1.41	[a] 1.69	......	......	0.59	1.51
Kalamazoo	S. C.	......	2.72	3.19	2.59	[c] 2.98	2.62	3.45	3.02	2.54	2.70	2.68	2.43	1.96	2.47
Marshall	S. C.	3.41^{10}	2.54	2.61	2.30	2.48	2.52	3.51	3.16	1.86	2.77	2.88	2.33	1.43	2.57
Birmingham	S. E.	......	A	5.08	4.88	4.12	4.66	5.08	4.36	[b] 3.58	......	3.88	5.01	3.46	3.83

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* At the Stations of the U. S. Signal Service during the year 1890, the observations were made by exposing the test-paper as follows: At Manistee, Grand Haven and Marquette from 8 A. M. to 8 P. M. At Port Huron from 8 A. M. to 3 P. M., all 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 23.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2. The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows, on weekly reports of sickness.

‡ Numbers in this column state the average annual relative amount of ozone by day for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

[The remaining foot-notes are on page 64.]

Eight lines in this Table are graphically represented in Diagram VIII., page 59.

DIAGRAM VIII.—OZONE, AVERAGE BY DAY, MONTHS IN 1890.

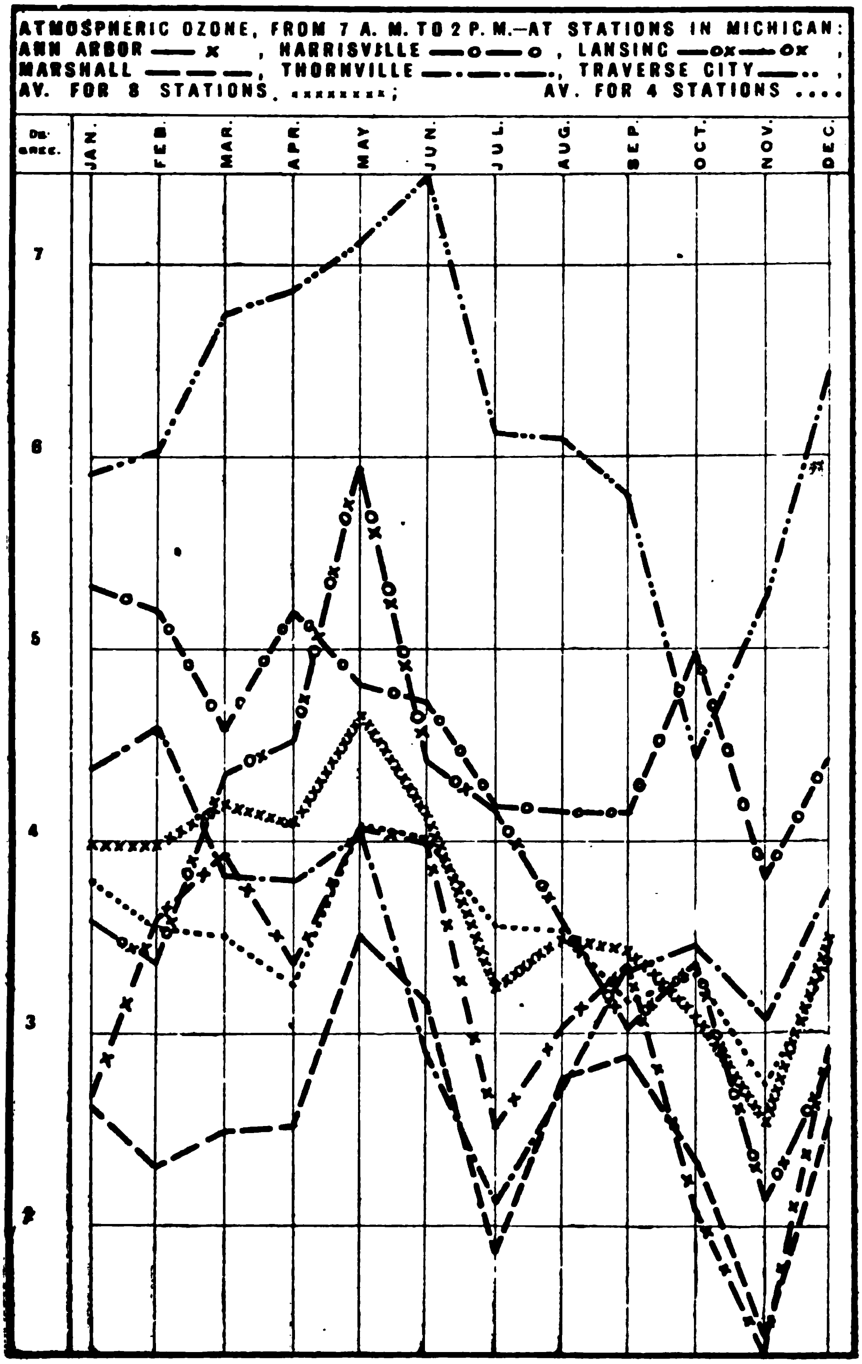


TABLE IX.—*Relative amount of Ozone in the Atmosphere at Night, during the Year and during each Month of the Year 1890, at 12 Stations, also Average lines for 8 Stations and for 4 Stations, in Michigan,—as indicated by Averages of Observations made Nightly by Exposing Test-paper, prepared according to Schönbein's formula, from 9 P. M. to 7 A. M.,—Recorded according to a Scale of 10 Degrees of Coloration of the Test-paper (greatest coloration by Ozone equals 10), by Observers for the State Board of Health, and for the U. S. Signal Service.**

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Degrees of Coloration of Test-paper.—Night Observations.**													
		Year.		Months, 1890.											
		Norm. §	1890.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 8 Stations‖	......	......	3.83	3.91	4.57	4.49	4.47	4.83	4,19	3.39	3.51	3.14	3.09	2.63	3.71
Av. for 4 Stations¶	......	......	3.40	3.44	3.72	3.63	3.32	3.72	4.28	3.07	3.27	2.84	3.03	2.73	3.78
Marquette	U. P.	......	††	4.93	......	5.54	5.59	5.74	4.93	4.26	4.71	2.55	3.79	3.43	4.28
Gulliver Lake	U. P.	......	‡‡	4.60[b]	6.65[e]	3.96	6.56	6.41	5.63	5.42	......	......	......	......	......
Manistee	N. W.	......	§§	4.70	3.18	......	5.66	6.25	5.40	4.53[a]	4.22	3.28	3.89	3.33	......
Traverse City	N. W.	4.08^{9}	6.22	6.70	7.15	7.41	6.89	7.96	7.30	6.19	5.00	4.58	4,18	4.83	6.39[a]
Alpena	N. E.	......	4.92	4.41	4.68	4.89	4.06	4.16	4.83	4.23	4.77	5.05	6.31	5.23	6.44
Harrisville	N. E.	4.89^{6}	4.97	5.44	5.98	5.38	4.99	5.12	4.80	4.65	5.18	4.38	4.53	3.99	5.35
Grand Haven	W.	......	3.22	3.60	4.17	3.63	3,46	4,56	6.20	2.80	2.59	1.95	1.49	1.76	2.89
Port Austin	B. & E.	......	‖‖	4.64	4.90	4.43[a]	4.93[c]	4.64	4.65[b]	3.20[a]	4.30[h]	......	......	......	......
Port Huron	B. & E.	......	2.57	2.73	2.51	2.73	2.66	2.83	2.77	2.61	2.64	2.25	2.05	2.13	2.98
Thornville	B. & E.	3.37^{14}	3.90	4.28	5.33	4.64	4.86	4.48	3.43	2.87	3.16	3.25	3.44	3.19	3.86
Alma	C.	......	¶¶	5.38	5.40	4.48	3.99	4.09	4.06[f]	......	......	3.38[g]	3.27	3.73	5.03[i]
Lansing, S. B. of H.	C.	3.66^{12}	4.15	3.51	3.80	4.44	4.93	6.45	5.27	4.19	3.80	3.22	4.08	2.49	3.64
Otsego	S. W.	......	2.71	2.60	3.61	3.44	2.86	2.96	3.16	2.13	2.51	2.02	2.50	1.88[b]	2.83
Albion	S. C.	......	3.35	3.70[a]	4.58	4.20[a]	4.26	4.71	3.65[b]	2.63[a]	3.23	2.71[b]	2.11	1.56	2.86
Ann Arbor	S. C.	2.90^{11}	3.04	3.24[d]	3.86	3.80	4.03	4.19	3.07	2.23[a]	2.69	2.72	2.29	1.83	2.47[b]
Battle Creek	S. C.	......	A	1.05	1.58	1.15	1.33	2.61	1.97	1.65	1.72[a]	......	......	0.38	1.57
Kalamazoo	S. C.	......	2.90	3.02	3.51	3.26[c]	3.09	3.32	3.30	2.65	3.09	2.12	2.27	1.79	3.35
Marshall	S. C.	3.03^{10}	2.29	1.83	2.33	2.60	2.93	2.80	2.87	2.26	2.58	2.25	1.56	1.23	2.25
Birmingham	S. E.	......	B	4.41	4.76	4.09	4.63	4.74	4.30	3.59[b]	......	3.75	5.05	3.19	3.93

* At the U. S. Signal Service Stations during the year 1890, the observations were made by exposing the test-paper from 8 P. M. to 8 A. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 23.

† The names of observers their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ The full names of the divisions and the counties in each division are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

§ Numbers in this column state the average annual relative amount of ozone by night for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of the numbers which state the average, denote the number of years included in the average.

‖ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Battle Creek, Alma, Gulliver Lake, Port Austin, Birmingham, Kalamazoo and the U. S. Signal Service Stations.

¶ This is an average line for Alpena, Grand Haven, Kalamazoo and Port Huron.

** Allowance has been made for difference in sensitiveness of test-paper in this table.

†† The average for 11 months is 4.53. ‡‡ For 7 months, 5.60. §§ For 10 months, 4.44. ‖‖ For 8 months, .46. ¶¶ For 10 months, 4.28. A For 10 months, 1.50. B For 11 months, 4.22.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the num bers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 26 days. e For 25 days. f For 22 days.
g For 21 days. h For 19 days. i For 18 days.

Eight lines in this table are graphically represented in Diagram IX., page 61.

DIAGRAM IX.—OZONE, AVERAGE BY NIGHT, MONTHS IN 1890.

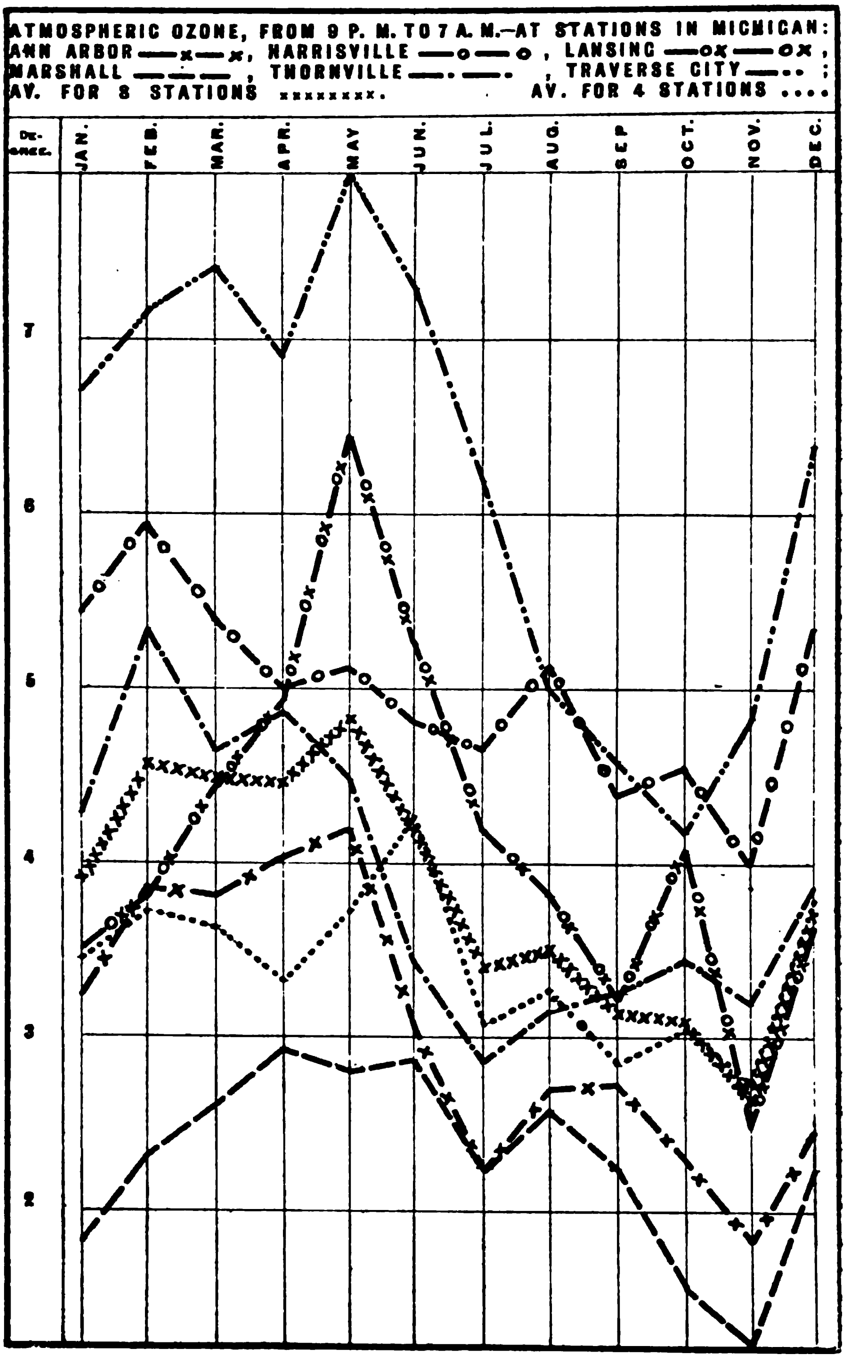


TABLE X.—*Average velocity of the Wind in Miles per Hour, for each Hour of the Day, by Months of the Year 1890. Compiled from Registers of the Robinson's Self-Registering Anemometer, exposed above the roof of the Capitol, and registering in the office of the State Board of Health, Lansing, Michigan.*

Months.	Average.			Hours (1890) and Average Miles per Hour.																							
	Av. 11 years, 1880-90.	1889.	1890.	A. M.					P. M.												A. M.						
				7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7
Year	9.8	9.0	9.5	8.8	9.5	10.0	10.7	11.3	11.6	12.0	11.9	11.6	10.9	9.8	9.0	8.7	8.7	8.9	8.6	8.4	8.2	8.0	8.1	8.4	8.2	8.2	8.0
January	11.2	10.0	12.2	13.2	12.2	12.3	14.2	15.2	15.5	15.6	15.0	13.8	12.9	11.6	11.2	11.4	11.9	11.5	11.1	9.9	9.7	9.9	10.6	11.1	11.0	11.4	11.9
February	11.5	10.7	11.7	10.0	10.8	13.1	12.9	13.0	13.9	13.9	13.9	14.1	13.3	11.8	11.1	10.9	10.9	11.2	10.3	10.7	11.4	10.8	10.4	10.9	11.4	11.2	9.7
March	11.0	9.5	10.3	10.1	10.9	11.6	11.8	12.4	12.7	12.8	13.2	14.0	13.0	11.7	10.7	9.7	9.0	9.4	8.8	8.1	8.0	8.1	8.2	8.5	8.1	8.8	8.6
April	10.9	9.5	8.3	7.8	8.7	8.6	9.2	9.9	9.8	10.4	11.0	10.7	9.7	8.1	6.4	7.1	7.3	7.9	7.7	8.1	7.2	7.3	7.1	7.5	7.8	7.0	6.4
May	9.6	9.5	10.6	11.2	11.9	11.9	12.5	12.6	12.7	13.4	13.2	13.5	12.6	11.7	10.2	8.9	8.8	8.9	8.6	8.6	8.3	8.5	9.1	9.4	9.5	8.9	10.0
June	8.5	8.1	8.0	6.9	8.3	8.2	8.4	9.7	9.7	9.7	10.0	9.7	9.3	9.5	7.6	7.1	7.4	7.7	7.6	7.3	6.8	7.1	6.7	6.7	6.9	6.7	6.4
July	7.9	5.9	7.7	6.6	7.7	7.9	8.5	9.0	9.5	9.9	10.3	10.6	10.6	2	7.1	5.8	7.1	7.7	7.3	7.1	6.3	6.1	6.0	6.2	5.8	5.8	5.7
August	7.4	7.3	7.5	7.3	7.2	8.0	8.5	8.8	8.9	9.5	9.0	9.0	8.5	7.8	6.3	6.4	7.1	7.5	7.3	7.1	6.9	6.8	6.4	6.6	6.3	6.2	5.9
September	8.5	8.9	7.7	6.7	7.9	8.8	9.7	9.6	9.6	10.2	9.3	9.3	8.5	7.0	6.2	6.5	6.4	7.1	7.2	7.4	6.7	6.8	6.8	6.8	7.0	6.7	6.2
October	8.7	7.4	8.4	7.5	8.3	8.6	9.1	10.4	10.2	10.4	10.2	9.0	9.0	8.0	8.6	8.7	8.2	7.7	7.1	7.0	7.2	7.1	7.8	8.1	7.6	7.7	8.2
November	10.9	9.3	*10.7	10.0	10.6	11.7	12.3	13.0	13.5	14.1	14.4	12.8	11.3	10.6	11.8	10.9	10.3	9.6	9.9	9.5	9.1	8.1	8.2	9.0	8.4	8.8	8.5
December	11.2	12.3	†10.6	8.3	8.9	10.0	11.3	12.4	13.3	13.7	13.5	12.9	11.5	10.9	10.8	10.9	10.5	10.3	10.2	10.1	10.2	9.7	9.7	9.4	9.2	8.6	8.4

* For only about 28 days.

† For only about 29 days.

The statements in the third figure column in Table X. of the average velocity of the wind in miles per hour, by months, during the year 1890, are graphically represented in Diagram XI., page 66: The remaining columns of Table X. for 1890, are graphically represented in Diagram X., page 63.

DIAGRAM X.—VELOCITY OF WIND, BY HOURS AND MONTHS. 1890

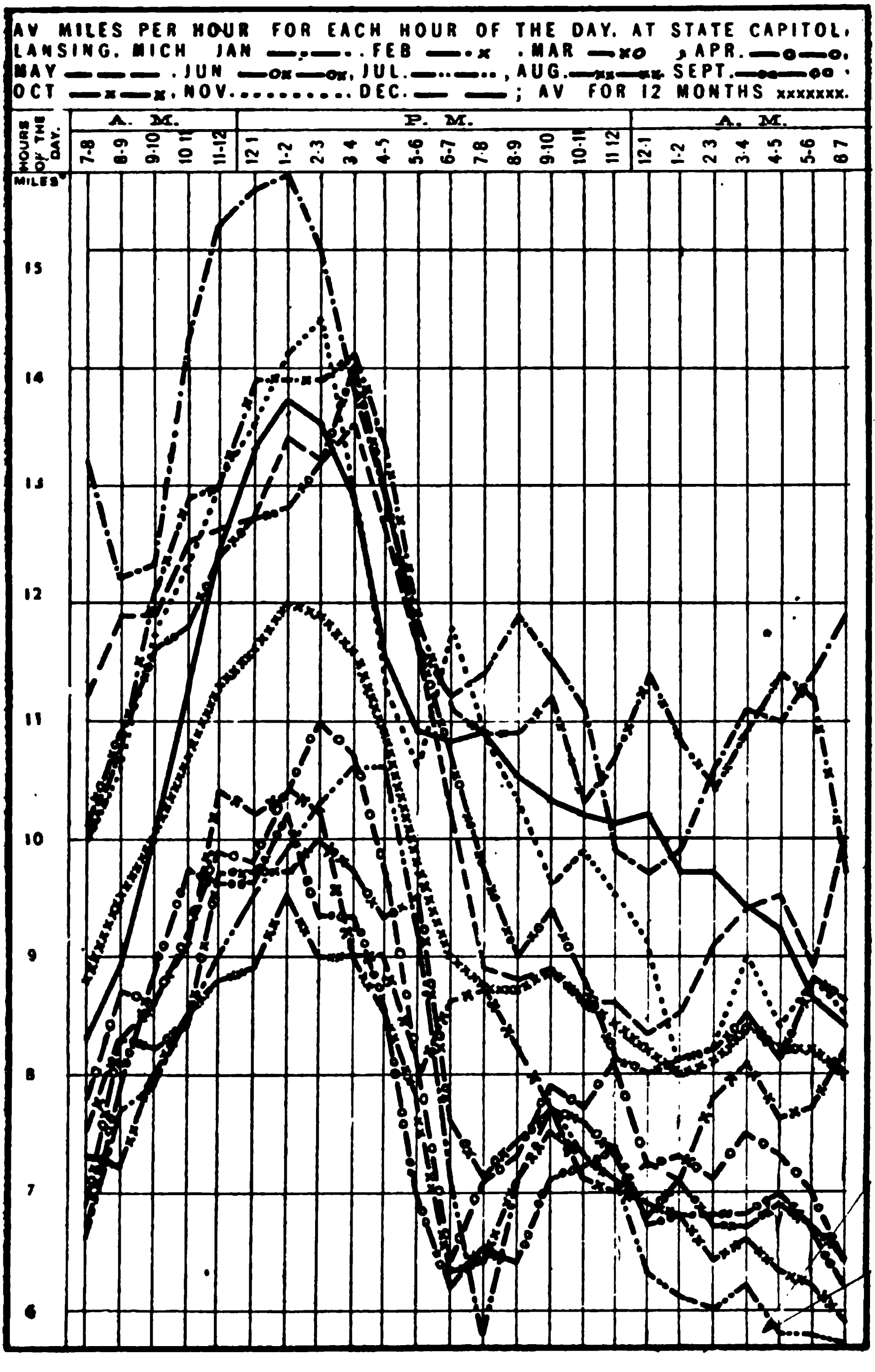


EXHIBIT 33.—*Average Velocity of the Wind in Miles per hour, by Year and Months in 1890, Compared with Annual and Monthly Averages for 1889, and for the 8 years 1882-89. From Registers of the Robinson's Self-Registering Anemometer.* These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Average Miles Per Hour.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 years, 1882-89..	9.5	11.0	10.5	10.2	10.1	9.3	7.9	7.7	7.7	8.6	9.5	10.6	10.9
1889 (7 Stations).....	9.2	10.2	10.7	9.4	9.5	9.9	7.5	6.9	7.7	9.1	8.8	9.7	11.0
1890 (7 Stations).....	9.7	12.1	11.7	11.2	10.3	9.9	7.4	8.3	7.9	8.4	8.6	10.4	10.8
In 1890 Greater than Av. for 8 years, 1882-89......	0.2	1.1	1.2	1.0	0.2	0.6	....	0.6	0.2	......	......	......	......
In 1890 Less than Av. for 8 years, 1882-89............	......	......	......	......	..	......	0.5	......	......	0.2	0.9	0.2	0.1
In 1890 Greater than in 1889.......	0.5	1.9	1.0	1.8	0.8	0	......	1.4	0.2	......	......	0.7	......
In 1890 Less than in 1889...............	......	......	......	......	......	0	0.1	......	......	0.7	0.2	......	0.2

* Gibbon's Anemometer was used at Ann Arbor.

EXHIBIT 34.—*Average Velocity of the Wind in Miles per hour, by Months for the Years 1880-89, and comparisons of 1890 with this Average and with the Year 1889. From Registers of the Robinson's Self-Registering Anemometer in the Office of the State Board of Health, State Capitol, Lansing, Michigan.*

Years, etc.	Miles, by Self-Registering Anemometer.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 years, 1880-89.	9.0	11.1	11.4	11.1	11.0	9.5	8.5	8.0	7.4	8.6	8.7	11.0	11.2
1889.................	9.0	10.0	10.7	9.5	9.5	9.5	8.1	5.9	7.3	8.9	7.4	9.3	12.3
1890.................	9.4	12.2	11.7	10.4	8.3	10.6	8.0	7.6	7.5	7.7	8.4	10.3	10.6
In 1890 Greater than Av. for 10 years, 1880-89.....	.4	1.1	.3	......	......	1.1	......	......	.1	......	......	......	......
In 1890 Less than Av. for 10 years, 1880-89...........	......	......	......	.7	2.7	......	.5	.4	......	.9	.3	.7	.6
In 1890 Greater than in 1889	.4	2.2	1.0	.9	......	1.1	......	1.7	.2	......	1.0	1.0	......
In 1890 Less than in 1889...........	......	......	......	......	1.3	......	.1	......	......	1.2	......	......	1.7

[Foot-notes to Table VIII., page 58.]

§ This line is an average for only the stations from which statements, nearly complete, were received for every month in the year. It does not include Alma, Birmingham, Port Austin, Gulliver Lake, Kalamazoo, Battle Creek and the Signal Service Stations.

‖ This is an average line for Alpena, Grand Haven, Kalamazoo and Port Huron.

¶ The average for 11 months is 5.13. †† For 7 months, 3.97. ‡‡ For 10 months, 4.77. §§ For 8 months, 3.76. ‖‖ For 10 months, 4.32. ¶¶ For 10 months, 1.51. A For 11 months, 4.35.

** Allowance has been made for difference in sensitiveness of test-paper in this table.

a, b, c. In the columns from January to December, inclusive, the letters a, b, c, etc., stand directly above the numbers from which they refer to the notes below.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 22 days. g For 20 days. h For 19 days.

TABLE XI.—*Average Velocity of the Wind in Miles per Hour for the Year and for each Month of the Year 1890, at 7 Stations in Michigan. Computed from Registers of the Robinsons's Self-Registering Anemometer,* by Observers for the State Board of Health, and for the U. S. Signal Service.*

Stations in Michigan.†	Division of the State.	Miles, by Self-Registering Anemometer.													
		Year.		Months, 1890.											
		Norm. ‡	1890.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 7 Stations ¶	....	......	9.7	12.1	11.7	11.2	10.3	9.9	7.4	8.8	7.9	8.4	8.6	10.4	10.8
Marquette	U. P.	8.9^{5}	9.4	10.3	12.6	9.9	10.7	9.1	6.8	8.6	9.6	9.8	7.1	9.7	8.7
Manistee	N. W.	8.3^{2}	8.2	10.0	10.2	9.6	8.4	8.0	6.2	7.3	6.8	7.4	7.2	8.7	9.0
Alpena	N. E.	......	§	.....	12.2	11.1	9.1	9.7	8.0	8.9	9.5	8.2	8.5	10.2	10.5
Grand Haven	W.	......	11.1	12.7	11.9	12.5	11.8	11.4	8.4	10.3	8.5	9.6	10.3	12.6	13.1
Port Huron	B. & E.	10.1^{9}	11.6	14.1	13.1	13.3	13.1	11.8	8.4	10.1	9.5	10.4	10.3	11.8	13.1
Lansing, S. B. of H.	C.	9.7^{11}	9.4	12.2	11.7	10.4	8.3	10.6	8.0	7.6	7.5	7.7	8.4	10.3	10.6
Ann Arbor	S. C.	8.9^{9}	8.7	13.1	11.2	11.2	9.3	8.7	6.4	6.1	5.7	5.9	7.7	9.1	9.6
Detroit	S. E.	9.4^{9}	9.7	12.1	11.1	11.4	10.2	9.6	7.5	8.2	7.7	8.3	9.0	10.5	11.3

* Gibbon's Anemometer was used at Ann Arbor.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ Numbers in this column state the average velocity of the wind in miles per hour for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

§ The average for 11 months is 9.6.

¶ Not including Alpena.

Graphic representations of statements made in Table XI., are given in Diagram XI., page 66, of statements in Exhibit 35 are given in Diagram XIII., page 67.

EXHIBIT 35.—DIRECTION OF WIND, 1878-89.—*Number of Observations per Month (made tri-daily), at which the Wind was blowing from the several (eight) points of Compass.—Annual and Monthly Averages for the 12 Years 1878-89, at Stations in Michigan.**

Points of Compass.	Average Number of Observations per Month—12 Years, 1878-89.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations	91	93	85	93	90	93	90	93	93	89	92	90	93
Calm	5	4	4	4	4	5	6	8	8	6	5	4	4
North	7	6	6	10	9	8	7	8	8	6	8	6	6
Northeast	8	6	7	10	11	11	9	8	10	7	8	7	5
East	6	5	6	7	8	8	6	5	6	6	5	5	5
Southeast	9	9	9	9	11	11	10	8	9	11	9	7	8
South	10	11	10	7	8	10	11	10	10	12	12	11	11
Southwest	17	22	16	12	12	15	16	18	17	18	18	19	23
West	14	16	14	14	11	12	13	16	12	12	13	17	17
Northwest	14	15	13	19	16	13	11	13	13	12	14	15	14

* At 12 stations in 1878; 16 in 1879; 19 in 1880; 19 in 1881; 21 in 1882; 19 in 1883; 21 in 1884; 21 in 1885; 16 in 1886; 17 in 1887; 13 in 1888, and 11 in 1889.

DIAGRAM XI.—VELOCITY OF WIND, BY MONTHS IN 1890.

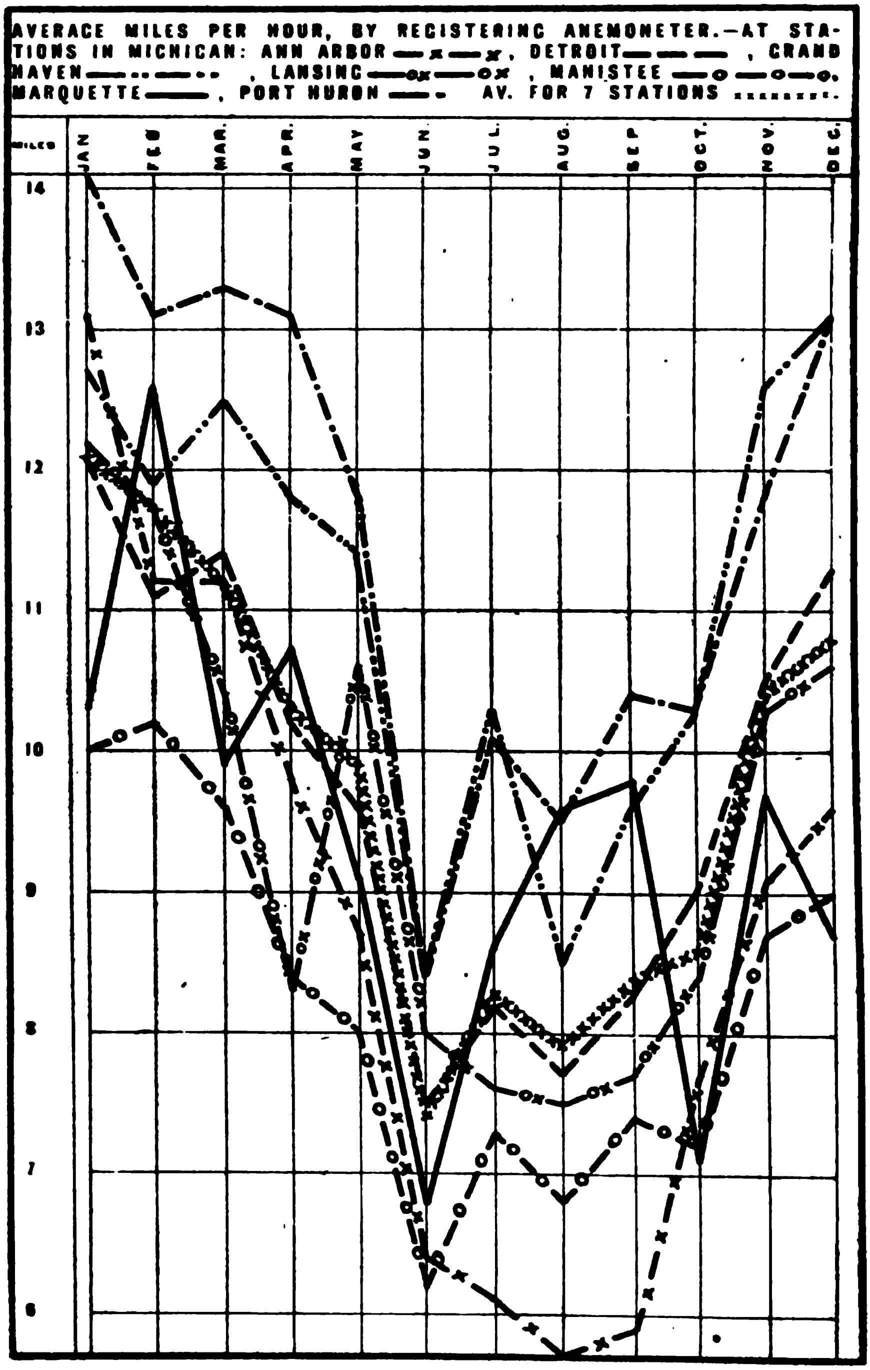
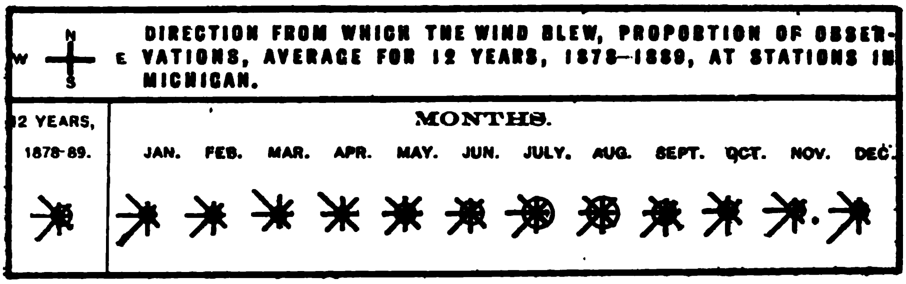


DIAGRAM XIII.—WIND, DIRECTION, IN MICH., AVERAGE 12 YEARS, 1878—1889.


DIRECTION FROM WHICH THE WIND BLEW, PROPORTION OF OBSERVATIONS, AVERAGE FOR 12 YEARS, 1878—1889, AT STATIONS IN MICHIGAN.

*SCALE, RADIUS .01 OF ONE INCH TO ONE OBSERVATION

TABLE XII.—*Number of Observations per Month (at 7 A. M., 2 P. M. and 9 P. M.,* daily), at which the wind was blowing from each of the Eight Principal Points of Compass, during the Year and during each Month of the Year 1890. Average for 12 Stations in Michigan.*†

Points of Compass.	Average Number of Observations per Month, 1890.												
	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All observations (12 Stations)	91	93	83	93	90	92	87	92	92	88	93	90	93
Calm	8	6	3	5	6	7	11	14	13	9	12	7	5
North	8	3	6	11	10	9	7	8	10	8	12	7	7
Northeast	8	3	8	9	14	10	6	6	7	13	5	7	9
East	5	3	8	5	8	3	6	5	4	7	6	4	5
Southeast	9	10	10	8	11	11	12	7	10	10	11	3	6
South	9	13	10	7	12	10	9	10	10	11	8	6	7
Southwest	17	20	14	13	13	18	19	22	13	17	12	25	21
West	12	22	12	18	5	13	9	10	9	8	10	16	17
Northwest	13	12	13	18	12	11	9	12	16	7	17	14	16

* At stations of the U. S. Signal Service the observations during the year 1890 were made at 8 A. M. and 8 P. M., 75th meridian time, and are not used in this table.

† The names of observers, their places of observation, and the counties and divisions of the State in which those places are situated are stated in Exhibit 1, page 2.

Graphic representations of statements in Table XII. are given in Diagram XIV., on this page.

DIAGRAM XIV.—WIND, DIRECTION, IN MICH., YEAR AND MONTHS, 1890.

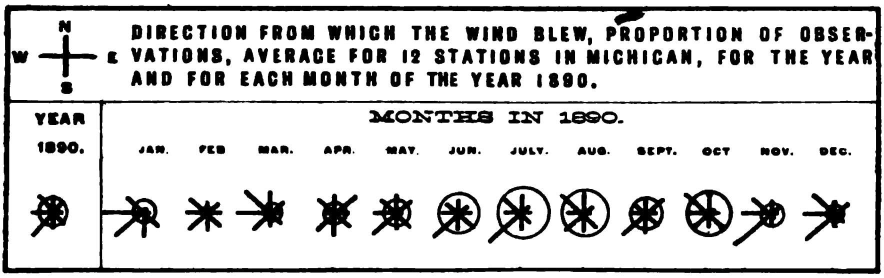
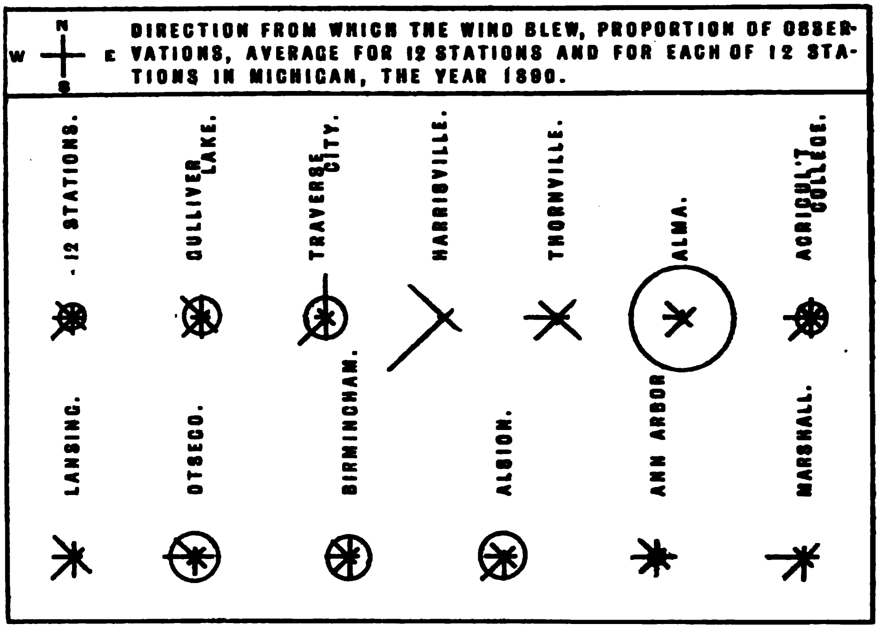

DIRECTION FROM WHICH THE WIND BLEW, PROPORTION OF OBSERVATIONS, AVERAGE FOR 12 STATIONS IN MICHIGAN, FOR THE YEAR AND FOR EACH MONTH OF THE YEAR 1890.

DIAGRAM XV.-WIND, DIRECTION, AT STATIONS IN MICHIGAN, 1890.



The construction and purport of the diagrams relating to direction of wind may by explained as follows:

In Diagrams XII., XIII., XIV. and XV., pages 70, 67, and 68, relating to the direction of the wind, the single figures or separate groups of lines are designed to indicate by the length of the lines the number and the proportion of regular observations at 7 A. M., 2 P. M. and 9 P. M. daily, at which the wind was blowing from each of the eight principal points of compass at the places and for the periods of time stated in the margin; and by the direction of the lines on the page, the direction of the wind. Each figure consists of lines drawn to a common center from some or all of the following directions on the page and indicating that at the times of observation the wind blew from points of the compass as follows: Lines toward the common center from the top of the page indicate observations that the wind was blowing from the north; from the right-hand side, observations that the wind was from the east; from the bottom of the page, that it was from the south; from the left-hand side, that it was from the west; from the upper left-hand corner, that it was from the northwest; from the upper right-hand corner, that it was from the northeast; from the lower right-hand corner, that it was from the southeast; and from the lower left-hand corner, that it was from the southwest. The number of regular observations at which the wind was blowing from the direction denoted by a line is indicated by the length of that line, .01 of an inch being the unit or the length of line for one observation. The circles indicate calms, the number of regular observations at which there was no wind being denoted by the length of the *radius* of the circle drawn about the point of convergence of the lines for a given place or period of time, the length of one observation being, as before, .01 of an inch. Thus, by Diagram XII., page 70, or by Table XIV., pages 71-74 it appears that at Thornville in March, 1890, at one of the regular tri-daily observations for the month there was a calm; at 25 observations the wind was blowing from the west, at 9 observations from the northwest; at 17 from the northeast, etc. For convenient study the top of these diagrams should be held toward the north. Definite numerical statements corresponding to these diagrams are given in Tables XII., XIII. and XIV., and Exhibit 35, pages 67, 69, 71-74, 65.

TABLE XIII.—*Average Number of Observations per Month for the Year 1890, at which the Wind was Blowing from each of the Eight Principal Points of the Compass, at each of 19 Stations* in Michigan; also the Average lines for 12 Stations, and for 7 Stations.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Divisions of the State.‡	Average Number of Observations Per Month, 1890.									
		All Obs.	Calms.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. for 12 stations ¶		90	8	8	8	5	9	10	17	12	13
Av. for 7 stations §		61	1	7	5	6	6	10	8	9	10
Marquette	U. P.	61	3	5	3	3	6	8	7	8	18
Gulliver Lake	U. P.	91	10	12	5	4	12	12	15	6	16
Manistee	N. W.	61	2	8	3	9	6	12	8	7	6
Traverse City	N. W.	91	11	24	5	1	6	12	21	6	6
Alpena	N. E.	61	1	5	3	5	9	7	6	14	12
Harrisville	N. E.	91	0	0	9	0	13	1	41	2	25
Grand Haven	W.	61	2	9	6	9	6	10	6	8	6
Port Huron	B. & E.	61	0	9	7	8	6	14	6	7	7
Thornville	B. & E.	91	0	2	14	6	18	4	17	18	12
Alma	C.	88	28	5	9	2	6	4	13	10	13
Agricultural College	C.	91	8	11	8	6	6	11	18	15	9
Lansing S. B. of H.	C.	91	0	8	8	5	13	12	17	12	16
Otsego	S. W.	91	13	5	7	10	9	10	5	17	15
Albion	S. C.	91	12	4	8	7	8	13	18	11	10
Ann Arbor	S. C.	91	4	10	6	10	8	11	13	15	15
Kalamazoo	S. C.	61	0	6	4	4	5	11	9	12	10
Marshall	S. C.	91	0	6	11	9	7	13	16	22	8
Birmingham	S. E.	85	11	9	6	5	5	12	12	14	13
Detroit	S. E.	61	0	5	9	6	5	8	11	8	9

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* At the Stations of the U. S. Signal Service the observations during the year 1890 were made at 8 A. M. and 8 P. M., 75th meridian time.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

‡ The full names of the divisions and counties in each division, are stated in Exhibit I. in a paper which follows on weekly reports of sickness.

¶ This is an average line for only the stations at which observations were made at 7 A. M., 2 P. M. and 9 P. M. daily; it does not include the U. S. Signal Service Stations, nor the station at Kalamazoo.

§ This is an average line for the 6 U. S. Signal Service Stations and Kalamazoo.

Graphic representations of statements in Table XIII. are given in Diagram XV., page 68.

DIAGRAM XII.—WIND, DIRECTION, AT STATIONS, BY MONTHS, 1890.

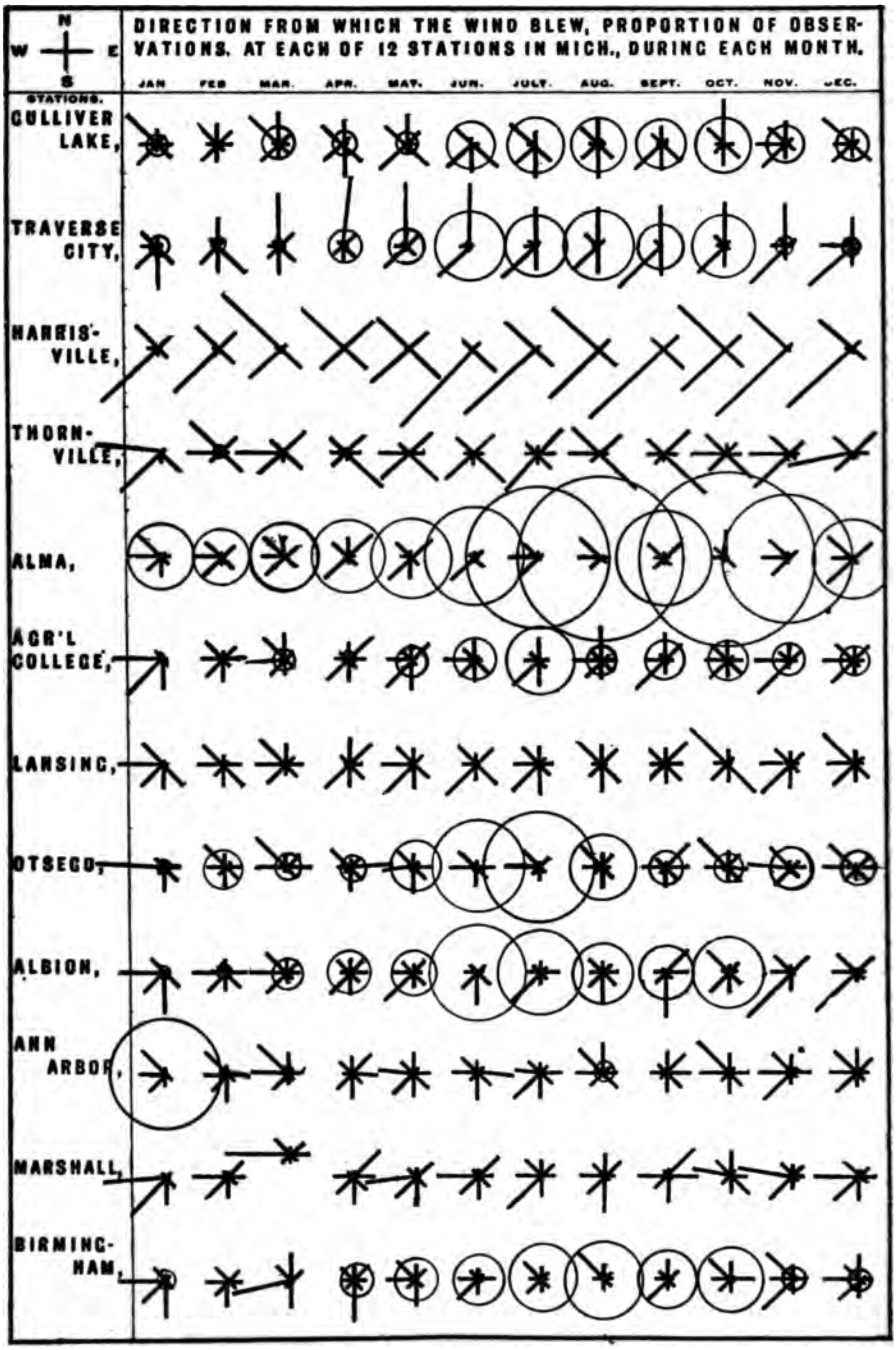

TABLE XIV.—*Number of Observations for each Month of the Year 1890, at which the wind was Blowing from each of the eight Principal Points of the Compass, at each of the 19 Stations* in Michigan; also the Average Lines for 12 and for 7 of the said Stations from which nearly Complete Observations were received for the Year. (Observations were made at 7 A. M., 2 P. M., and 9 P. M., Daily.)†*

Stations in Michigan. (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	January.										February.										March.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. 12 Stations ...	....	93	6	3	3	8	10	13	20	22	12	83	3	6	8	8	10	10	14	12	18	93	5	11	9	5	8	7	13	18	18
Av. 7 Stations	....	62	0	3	1	5	7	13	9	16	8	56	0	5	4	8	7	8	8	8	9	62	1	7	5	5	6	5	7	11	15
Marquette	U. P.	62	2	0	2	2	6	6	9	17	18	56	0	4	4	1	7	8	8	8	16	62	2	7	3	3	6	5	2	8	26
Gulliver Lake....	U. P.	93	6	9	6	9	11	4	16	10	22	84	3	12	11	9	5	10	12	6	16	93	9	17	7	5	7	8	14	4	22
Manistee	N. W.	62	0	3	3	8	10	12	8	14	4	56	0	8	3	11	8	7	7	6	6	62	0	6	4	13	5	7	9	7	11
Traverse City.....	N. W.	93	6	5	3	3	13	24	17	9	13	84	4	16	5	1	20	14	14	3	7	93	4	29	11	0	13	16	10	7	4
Alpena	N. E.	62	0	6	0	9	4	11	8	19	5	56	0	3	3	6	8	8	6	14	8	62	2	1	2	5	7	2	7	16	20
Harrisville	N. E.	93	0	0	11	1	8	5	43	7	18	84	0	0	13	0	12	1	35	2	21	93	0	0	4	0	16	1	25	4	43
Grand Haven	W.	62	0	4	0	7	10	12	4	13	12	56	0	6	6	11	8	6	6	6	7	62	1	9	9	7	9	5	5	9	8
Port Austin.......	B. & E.	93	6	11	5	4	2	8	32	15	10	84	6	14	16	7	1	7	24	7	2	93	7	30	3	1	5	12	17	12	6
Port Huron	B. & E.	62	1	1	2	0	5	22	8	14	9	56	0	6	7	6	6	9	8	6	8	62	0	12	5	1	6	9	9	9	11
Thornville.........	B. & E.	93	0	1	3	0	17	6	30	35	1	84	0	0	12	5	16	2	8	18	23	93	1	2	17	2	14	5	18	25	9
Alma................	C.	93	18	2	3	5	6	11	11	19	18	84	15	3	10	1	9	4	15	15	12	93	18	11	10	0	9	2	14	13	16
Agr'l College	C.	93	2	3	1	4	6	17	27	27	6	84	2	4	9	12	6	12	14	12	13	93	6	15	5	3	7	8	12	21	16
Lansing, S. B. of H.	C.	93	0	1	2	3	16	14	17	24	16	84	0	6	3	10	16	12	8	14	15	93	0	11	6	9	9	6	15	17	20
Otsego..............	S. W.	93	4	4	2	9	11	14	5	37	7	84	10	8	4	9	10	11	6	10	16	93	7	7	10	13	9	4	3	17	23
Albion	S. C.	93	4	2	1	1	11	22	16	25	11	84	4	7	2	12	12	10	14	18	5	93	8	6	9	7	5	6	16	20	16
Ann Arbor.........	S. C.	93	30	4	1	0	5	7	13	15	18	84	1	5	2	13	6	15	12	13	17	93	3	13	4	7	5	6	12	20	23
Battle Creek......	S. C.	93	0	1	2	7	13	9	28	26	7	84	0	6	11	1	12	10	9	28	7	93	0	10	0	4	11	5	14	41	8
Kalamazoo.........	S. C.	62	0	2	1	5	10	16	6	19	3	56	1	3	3	9	7	11	7	8	7	62	1	10	4	2	6	4	10	11	14
Marshall...........	S. C.	93	0	1	3	2	7	15	28	34	3	84	0	3	12	10	7	12	17	19	4	93	0	4	11	11	6	6	7	36	12
Birmingham.......	S. E.	93	6	4	4	1	5	20	17	26	10	76	2	2	9	8	6	14	11	13	11	93	2	15	9	1	2	16	5	32	11
Detroit.............	S. E.	62	0	2	1	4	4	10	17	19	5	56	0	5	5	10	2	6	12	5	11	62	0	7	8	4	5	5	7	14	12

Diagram XII., page 70, gives 12 lines in this table, and is explained on page 68. * For names of observers, etc., see Exhibit 1, page 2. For names of divisions, etc., see Exhibit I., in a paper which follows on weekly reports of sickness. † With exceptions stated for U. S. Signal Service Stations in Table I., page 23. ‡ This line includes only the 12 stations, at which observations were made tri-daily, and from which statements complete, or nearly complete, were received for every month of the year; it does not include Port Austin, Battle Creek, Kalamazoo and the U. S. Signal Service Stations. § This is an average line for the 6 U. S. Signal Service Stations and Kalamazoo.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1890.—Observations at which the Wind was blowing from Direction named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	April.										May.										June.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N.W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N.W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N.W.
Av. 12 Stations	--------	90	6	10	14	8	11	12	13	5	12	92	7	9	10	3	11	10	18	13	11	87	11	7	6	6	12	9	19	9	9
Av. 7 Stations	--------	60	1	11	9	6	6	11	5	3	9	62	1	8	6	6	7	11	7	8	9	60	2	4	6	6	10	11	8	7	8
Marquette	U. P.	60	3	5	7	2	6	7	7	4	19	62	2	10	5	6	7	6	9	4	13	60	3	5	4	4	12	5	6	8	13
Gulliver Lake	U. P.	90	7	13	5	2	13	19	13	2	16	93	6	16	9	2	16	5	20	3	16	90	13	4	2	4	19	15	18	2	13
Manistee	N. W.	60	0	15	7	0	5	15	2	1	6	62	1	7	3	7	3	15	11	5	10	60	2	1	2	6	5	18	11	10	5
Traverse City	N. W.	90	9	38	10	2	9	8	8	1	5	93	10	35	10	0	7	3	17	8	3	90	19	34	1	0	0	3	24	6	3
Alpena	N. E.	60	0	9	7	4	12	5	7	6	10	62	0	10	5	7	12	3	6	7	12	60	4	0	3	9	19	5	3	5	12
Harrisville	N. E.	90	0	0	21	0	16	0	18	1	34	93	0	0	14	1	24	0	28	2	24	90	0	0	5	0	18	0	58	0	9
Grand Haven	W.	60	4	10	8	11	3	13	4	3	4	62	3	5	5	8	4	16	8	5	8	60	2	2	4	10	6	14	11	8	3
Port Austin	B. & E.	89	8	24	21	2	6	7	22	2	2	93	5	9	16	8	6	6	23	16	4	90	20	13	14	7	2	9	13	12	0
Port Huron	B. & E.	60	0	17	10	4	3	18	1	2	5	62	1	13	9	1	11	14	5	7	1	60	0	15	13	0	9	13	6	1	3
Thornville	B. & E.	90	0	2	15	8	27	4	11	11	12	93	0	0	17	8	22	1	21	17	7	90	0	0	15	6	24	7	21	5	12
Alma	C.	90	20	10	17	3	6	4	18	0	12	93	22	3	15	1	6	12	17	6	11	68	27	3	6	2	9	1	17	0	3
Agr'l College	C.	90	4	10	18	10	6	13	16	7	6	93	9	8	13	1	4	17	20	14	7	90	12	12	3	4	10	12	12	16	9
Lansing, S. B. of H.	C.	90	1	14	15	6	11	13	20	3	7	93	0	9	7	0	11	13	23	17	18	90	0	6	13	2	16	9	23	7	14
Otsego	S. W.	90	7	4	7	23	10	14	3	8	14	93	14	7	5	11	9	15	2	17	13	90	25	4	0	10	9	11	3	15	13
Albion	S. C.	90	12	8	10	9	7	12	16	6	10	93	13	5	9	5	10	9	22	12	8	90	26	1	6	4	10	18	12	7	6
Ann Arbor	S. C.	90	1	9	15	14	9	15	12	6	9	93	2	12	3	8	12	11	17	20	8	90	1	7	5	20	10	15	6	14	12
Battle Creek	S. C.	90	0	3	5	12	3	4	21	34	8	93	0	2	5	6	0	7	22	39	12	87	0	0	3	17	3	1	11	52	0
Kalamazoo	S. C.	60	0	9	9	7	4	11	6	4	10	62	0	6	4	1	7	15	6	14	9	60	0	1	3	4	10	12	7	13	10
Marshall	S. C.	90	0	3	20	12	11	15	13	11	5	93	0	5	11	3	8	16	16	27	7	90	0	4	16	9	9	12	13	22	5
Birmingham	S. E.	89	9	9	12	7	7	23	6	6	10	86	12	8	8	1	6	14	7	16	14	77	14	6	4	9	4	9	15	10	6
Detroit		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8	8	7	3	8	62	1	2	9	9	8	7	4	14	8	60	0	3	11	9	8	9	9	4	7

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*†§ [illegible] XII., page 70, which is explained on page 68.

TABLE XIV.—CONTINUED.—*Direction of Wind, Months in 1890.—Observations at which the Wind was blowing from Directions named.*

Stations in Michigan.* (Those of U. S. Signal Service in italics.)	Division of the State.*	July.										August.										September.									
		Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.	Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
Av. 12 Stations....	....	92	14	8	6	5	7	10	22	10	12	92	18	10	7	4	10	10	18	9	16	88	9	8	13	7	10	11	17	8	7
Av. 7 Stations	....	62	2	7	4	3	5	15	10	8	8	62	1	6	5	6	8	11	6	10	10	60	1	9	8	5	5	15	5	7	6
Marquette........	U. P.	62	1	2	5	3	6	10	9	6	20	62	2	3	2	8	5	18	9	8	17	60	2	10	1	1	4	11	8	13	10
Gulliver Lake....	U. P.	93	15	8	1	1	12	18	15	5	18	93	15	14	3	4	11	19	11	4	12	90	14	10	5	3	14	14	20	3	7
Manistee..........	N. W.	62	2	9	1	4	3	20	14	2	7	62	2	10	2	8	10	13	5	7	5	60	4	8	2	9	6	16	7	5	3
Traverse City.....	N. W.	93	17	21	3	0	0	14	26	7	5	93	19	21	5	0	0	16	19	3	10	90	13	23	0	0	0	16	32	1	5
Alpena............	N. E.	62	4	4	1	1	11	9	8	12	12	62	1	3	2	1	14	11	2	14	14	60	1	3	2	5	10	12	4	13	10
Harrisville........	N. E.	93	0	0	2	0	13	2	53	0	23	93	0	0	7	0	13	1	39	0	33	90	0	0	11	0	15	0	55	0	9
‡*Grand Haven*....	W.	62	2	13	3	5	1	19	9	7	3	62	2	10	4	9	6	8	6	8	9	60	1	10	13	10	5	14	1	5	1
Port Austin	B. & E.	91	12	22	6	2	1	9	16	19	4	72	9	19	5	6	6	8	8	7	4	......	......	....	....	....	....	..	....	....	....
Port Huron.......	B. & E.	62	1	10	11	4	1	25	6	3	1	62	0	10	7	2	9	13	3	10	8	60	0	8	15	3	3	28	4	3	4
Thornville........	B & E.	93	0	4	19	10	11	6	27	7	9	93	0	2	16	4	28	0	6	17	20	90	0	0	19	7	32	4	7	9	12
Alma......	C.	93	39	4	4	2	2	0	15	16	11	91	45	0	2	3	4	0	8	18	16	79	26	4	13	3	5	3	7	6	12
Agr'l College.....	C.	93	19	13	2	5	5	14	20	8	7	93	8	19	5	6	9	10	13	15	8	90	11	15	13	5	3	8	22	9	4
Lansing, S. B of H.	C.	93	0	10	5	6	8	16	21	14	13	93	1	12	12	3	14	15	12	5	19	90	0	9	17	10	12	10	12	8	12
Otsego............	S. W.	93	30	3	7	2	5	8	6	19	13	93	18	8	9	4	9	12	6	11	16	90	10	3	18	12	10	12	5	13	7
Albion............	S. C.	93	23	6	5	11	6	8	22	7	5	92	17	6	6	8	10	17	11	7	10	90	15	0	15	12	5	25	9	7	2
Ann Arbor........	S. C.	92	0	6	6	12	9	15	20	14	10	93	6	18	6	8	11	2	9	15	18	90	0	12	14	13	12	16	6	10	7
Battle Creek......	S. C.	93	1	0	2	20	5	0	18	41	6	90	0	1	2	17	2	2	11	52	3	......	......	....	....	....	....	..	....	....	....
Kalamazoo........	S. C.	62	1	5	2	3	1	10	12	19	9	62	0	5	5	5	4	13	9	14	7	60	0	14	7	4	2	17	6	3	7
Marshall..........	S. C.	93	0	9	10	8	2	12	25	14	18	93	0	12	12	7	4	21	14	14	9	90	0	4	21	17	3	15	10	16	4
Birmingham	S. E.	80	19	7	5	3	6	7	11	8	14	80	21	9	5	4	5	7	2	7	20	79	16	11	8	3	5	5	16	8	7
Detroit............	S. E.	62	1	5	8	4	10	10	15	5	4	62	1	4	10	12	6	4	5	9	11	60	0	8	15	3	5	12	5	4	8

* ‡ § For these references see foot-notes to this table on page 71.

NOTE.—Graphic representations of statements for 12 lines in this table are given in Diagram XII., page 70, which is explained on page 68.

TABLE XIV.—CONCLUDED.—*Direction of Wind, Months in 1890.—Observations at which the Wind was blowing from Directions named.*

Stations in Michigan.* (Those of U. S. Signal Service in Italics.)	Divisions of the State.*	October.										November.										December.									
		Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total.	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.	Total	Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.
Av. 12 Stations	....	93	12	12	5	6	11	8	12	10	17	90	7	7	7	4	3	6	25	16	14	93	5	7	9	5	6	7	21	17	16
Av. 7 Stations	....	62	3	9	4	8	6	5	6	10	12	60	2	6	4	4	2	8	12	11	11	62	1	6	4	5	6	9	10	11	12
Marquette	U. P.	62	4	11	1	2	4	8	4	5	23	60	8	6	2	4	1	6	4	6	23	62	3	2	1	0	3	14	4	12	23
Gulliver Lake	U. P.	93	15	24	1	6	11	12	7	5	12	90	11	12	5	2	5	8	18	16	13	93	9	9	5	4	14	7	14	10	21
Manistee	N. W.	62	8	14	2	14	2	3	7	6	6	60	3	12	2	5	4	9	10	10	5	62	2	4	4	12	7	7	9	11	6
Traverse City	N. W.	93	18	24	4	0	2	12	21	4	8	90	6	23	6	3	0	8	29	9	6	93	5	16	2	1	3	11	31	18	6
Alpena	N. E.	62	1	7	2	7	9	2	6	16	12	60	0	2	1	4	1	9	7	24	12	62	0	8	3	2	3	11	8	16	11
Harrisville	N. E.	93	0	0	12	0	14	0	33	0	34	90	0	0	4	0	3	1	53	1	28	93	0	0	7	0	9	3	47	3	24
Grand Haven	W.	62	3	18	4	14	7	2	1	9	4	60	1	8	6	7	6	3	12	8	9	62	0	10	10	6	10	6	5	10	5
Port Austin	B. & E.	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....	......	......	....	....	....	....	..	....	....	....
Port Huron	B. & E.	62	2	5	7	8	8	6	7	9	10	60	0	8	2	3	2	13	11	10	11	62	0	4	1	8	10	9	7	10	13
Thornville	B. & E.	93	2	6	9	9	20	0	13	19	15	90	1	1	11	6	5	4	26	21	15	93	0	0	17	8	3	3	13	35	14
Alma	C.	93	48	16	2	1	6	0	3	8	9	90	35	3	7	0	2	3	12	14	14	93	22	2	13	1	4	3	19	11	18
Agr'l College	C.	93	11	11	5	9	11	9	13	12	12	90	9	10	9	4	2	4	25	19	8	93	8	7	11	6	5	8	17	17	14
Lansing, S. B. of H.	C.	93	0	8	4	2	21	10	12	8	28	90	0	7	9	4	6	13	22	17	12	93	0	8	6	4	10	10	16	15	24
Otsego	S. W.	93	8	9	9	10	11	7	4	13	22	90	12	4	6	8	6	3	12	23	16	93	9	3	9	10	8	7	10	18	19
Albion	S. C.	93	20	4	7	5	10	12	15	4	16	90	3	3	12	3	3	10	34	10	12	93	3	2	13	5	6	6	31	13	14
Ann Arbor	S. C.	93	0	10	3	10	10	12	7	17	24	90	0	10	3	10	4	7	22	19	15	93	0	13	11	6	6	8	16	15	18
Battle Creek	S. C.	93	0	15	6	5	7	12	7	31	10	90	0	6	7	9	5	10	9	35	9	93	0	3	8	8	20	20	5	15	14
Kalamazoo	S. C.	62	0	7	4	5	8	5	6	12	15	60	0	5	5	3	2	4	23	9	9	62	0	4	3	3	4	10	11	12	15
Marshall	S. C.	93	0	17	3	9	14	10	7	21	12	90	0	7	8	6	3	7	19	30	10	93	0	4	7	9	6	13	19	24	11
Birmingham	S. E.	90	18	10	3	13	3	7	9	11	16	88	6	8	2	5	2	8	23	13	21	89	6	14	4	5	3	10	16	19	13
Detroit	S. E.	62	0	2	9	7	1	7	10	11	15	60	1	4	7	0	1	10	18	8	11	62	0	7	7	1	3	7	23	4	10

* ‡ § For these references see foot-note to this table on page 71.

NOTE.—Diagram XII., page 70, exhibits lines showing, by months, directions of wind at each of 12 stations in this table; for each month and station, the diagram represents the figures given in this table for the same month and station; it is explained on page 68.

DIAGRAMS RELATING TO METEOROLOGICAL CONDITIONS.

Most of the diagrams in this paper are to be read by tracing each irregular line across the diagram from left to right, and noting at what point it intersects each of the perpendicular lines having the name of the month at the top. What station is represented by the irregular line may be learned from the head of the diagram. The degree of value denoted by the intersection may be learned by referring to the figures in the left-hand column. Thus, in Diagram I., page 22, relating to average temperature in 1890, tracing the line "— — —" representing Gulliver Lake, it may be seen that the average temperature at Gulliver Lake was, in January, about 20°, in March about 20°, in August about 60°, in October about 46°, etc. Definite numerical statements of the average temperature for each month at each station may be found in Table I., page 23, and accompanying each diagram is a table giving exact numerical statements for the conditions represented. The average lines given in each table are represented in the corresponding diagram by an × line, thus × × × × and a dotted line, thus .... The lines in the diagrams give more ready general comparisons of stations with each other, or of months, with each other, than is possible from the mere numerical statements. By Diagram II., page 28, it appears at a glance that the average daily range of temperature at Birmingham and Marshall in 1890 was, during July, higher than at any other of the ten stations represented in that diagram, and during February was lower at Thornville. The marked agreement in the course of the lines in Diagram I., page 22, representing mean monthly temperature at eight stations, and also that the agreement is closer in September, October, November and December than in the other months, appear at once on reference to the diagram. The resemblance between the lines in Diagram I., page 22, relating to mean temperature by months in 1890, and those in Diagram III., page 35, relating to absolute humidity of the atmosphere for the same periods, is apparent. By Diagram X., page 63, it appears that in every month of the year the highest velocity of the wind (on an average for the month) is reached between 1 P. M. and 3 P. M., and that the lowest velocity occurs in the latter part of the night or in early morning, and that in 1890, at Lansing, the months of most wind were January and February. By reference to diagram XI., page 66, it may be seen that at other stations in Michigan where records of actual miles of wind traveled were kept, January and December were, in 1890, the months of greatest wind. These statements illustrate the reading of the diagrams for any use it may be desired to make of the tables and diagrams. The four diagrams relating to direction of the wind are constructed on a different principle and the manner of reading them is explained on preceding pages in this article.

TABLE XV.—*Average Daily Range of Atmospheric Pressure (as determined from three daily observations*) for the Year 1890, at each of 19 Stations, and the average lines for 12 Stations and for 7 Stations in Michigan—Stations arranged in order by Latitude, those farthest North first.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Average Daily Range of Barometer—Year and Months, 1890.														
	Norm. ‡	1889.	1890.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations §	......	.....	.234	.400	.308	.256	.259	.195	.137	.136	.163	.167	.186	.287	.315
Av. for 7 Stations ‖	......	.....	.231	.404	.310	.247	.256	.190	.133	.139	.167	.175	.180	.259	.316
Marquette	U. P.	.....	.236	.373	.321	.226	.251	.184	.153	.138	.178	.206	.172	.305	.321
Gulliver Lake	U. P.	.218[8]	.239	.406	.318	.230	.256	.187	.185	.133	.163	.201	.166	.312	.368
Alpena	N. E.	.....	.250	.463	.338	.252	.265	.204	.150	.152	.181	.193	.165	.285	.358
Traverse City	N. W.	.219[9]	.231	.390	.309	.246	.255	.191	.137	.148	.163	.183	.163	.270	.320
Harrisville	N. E.	.234[6]	.248	.438	.325	.247	.267	.210	.150	.151	.186	.194	.181	.274	.356
Manistee	N. W.	.....	.229	.410	.300	.243	.262	.191	.123	.140	.167	.181	.167	.260	.306
Alma	C.	.....	.241	.425	[c] .311	.268	.268	.204	[f] .162	.137	.174	.183	.198	.278	[h] .283
Grand Haven	W.	.....	.227	.407	.297	.244	.257	.193	.121	.134	.162	.171	.188	.248	.305
Port Huron	B.&E.	.....	.235	.413	.324	.265	.258	.190	.133	.144	.161	.164	.194	.247	.322
Thornville	B.&E.	.216[7]	.264	.408	.319	.263	.254	.195	.140	.152	.168	.168	.198	.598	.310
Agricultural College	C.	.208[8]	.224	.408	.302	.250	.258	.179	.121	.130	.156	.155	.184	.352	.300
Lansing, S. B. of H.	C.	.207[9]	.230	.404	.301	.259	.259	.197	.131	.133	.163	.152	.193	.262	.304
Birmingham	S. E.	.211[4]	.232	[a] .400	[c] .308	.269	.256	[b] .199	[c] .134	[a] .130	[e] .158	.157	[a] .192	.248	.332
Otsego	S. W.	.....	¶	.....	.335	.253	.258	.193	.128	.186	.155	.154	.215	.245	.299
Detroit	S. E.	.....	.227	.393	.313	.257	.251	.184	.131	.131	.158	.152	.193	.342	.313
Ann Arbor	S. C.	.206[9]	.227	.386	.306	.261	.259	.191	.133	[b] .131	.162	.151	.191	.240	.310
Marshall	S. C.	.206[8]	.223	.377	.289	.251	.263	.201	.131	.132	.159	.156	.199	.321	.298
Albion	S. C.	.....	.228	.391	.302	.256	.262	.192	.134	.134	[a] .155	.152	.205	.249	.300
Kalamazoo	S. C.	.....	.216	.367	.285	.239	.246	.185	.120	.134	.159	.159	.187	.226	.289
Tecumseh	S. C.	.....	.222	.373	.300	[i] .276	.246	.189	.136	.126	.148	.149	[g] .165	[d] .241	.310

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* At Stations of the U. S. Signal Service the observations during the year 1890 were made at 8 A. M. and 8 P M., 75th Meridian time. The corresponding local time for each of these stations is stated in star (*) foot-note to Table I., page 23.

† The names of observers, their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2. The average atmospheric pressure at each of these stations, by months in 1890, is given in Table XVII., page 80.

‡ Numbers in this column state the average daily range of atmospheric pressure for periods of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the average daily range, denote the number of years included in the average.

§ Not including Kalamazoo and the U. S. Signal Service Stations.

‖ This line is an average for the 6 U. S. Signal Service Stations and Kalamazoo.

¶ The average for 11 months is .216.

a For 30 days. b For 29 days. c For 27 days. d For 26 days. e For 23 days. f For 22 days. g For 21 days. h For 18 days. i For 17 days.

NOTE.—The latitude and elevations of some of the stations are stated in Exhibit 2, page 3.

The daily range is found by subtracting the lowest observation from the highest observation, 7 A. M. to 7 A. M.

TABLE XVI.—*Range of Atmospheric Pressure (as determined from 3 Daily Observations*) for the Year and for each Month and for the Average Month of the year 1890, at 17 and at each of the 17 Stations†, and Average lines for 10 Stations and for 7 Stations in Michigan; also the Norm.—Average Monthly Range for a series of years. Stations named in order by Latitude, those farthest North first.*

Stations in Michigan.† (Those of the U. S. Signal Service in Italics.)	Range of Barometer.—Year and Months, 1890.															
	Norm. §	1889.	1890.	Av. Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
For 10 Stations ‖	......	.....	1.969	1.354	1.734	1.485	1.754	1.658	1.205	1.115	.987	.979	1.115	1.478	1.283	1.450
Av. for 10 Stations¶	......	.....	1.417	.905	1.265	1.055	1.216	1.200	.782	.655	.605	.584	.729	.941	.813	1.015
Av. for 7 Stations **	......	.....	1.244	.905	1.287	1.088	1.173	1.167	.814	.659	.614	.581	.755	.901	.795	1.026
Marquette	......	1.633	1.374	.948	1.125	1.250	1.096	1.030	.918	.760	.664	.661	.882	.993	.840	1.156
Gulliver Lake	1.606^{3}	1.707	1.408	.955	1.281	1.207	1.191	1.059	.858	.722	.612	.662	.941	.877	.874	1.176
Alpena	......	1.850	1.551	.970	1.551	1.307	1.098	1.150	.816	.651	.656	.606	.842	.887	.874	1.197
Traverse City	1.209^{9}	1.796	1.351	.912	1.299	1.152	1.213	1.063	.778	.667	.651	.601	.858	.764	.818	1.081
Harrisville	1.629^{6}	1.790	1.404	.922	1.256	1.186	1.094	1.181	.756	.640	.614	.590	.828	.911	.865	1.140
Manistee	......	1.680	1.338	.889	1.248	1.091	1.095	1.099	.814	.679	.594	.600	.814	.833	.786	1.009
Port Austin	......	1.901	.....	‡‡	1.188	1.004	1.488	1.261	.851	.622	.642	.591	.....	.....	.....	.....
Alma	......	.....	.....	§§	1.334	1.078	1.161	1.213	.833	.787	.610	.580	.759	.838	1.202	.....
Grand Haven	......	.....	1.395	.886	1.395	.973	1.125	1.196	.829	.654	.570	.591	.769	.825	.744	.951
Port Huron	......	1.790	1.460	.911	1.250	1.050	1.290	1.250	.810	.640	.626	.528	.663	.985	.836	1.009
Thornville	1.239^{7}	1.797	1.406	.906	1.249	1.068	1.212	1.303	.716	.618	.626	.562	.677	.968	.870	1.085
Agricult'l College	1.186^{8}	1.796	1.462	.893	1.302	1.024	1.241	1.227	.811	.592	.556	.606	.693	.862	.824	.976
Lansing, S. B. of H.	1.147^{9}	1.762	1.395	.877	1.302	.977	1.201	1.245	.792	.621	.582	.551	.687	.899	.812	.974
Birmingham	1.429^{4}	1.688	1.451	.935	1.184	1.001	1.305	1.260	.747	.636	.645	.672	.641	1.311	.790	1.024
Otsego	......	.....	.....	¶¶	.....	.885	1.199	1.252	.765	.618	.559	.545	.710	.890	.764	.939
Detroit	......	1.730	1.510	.886	1.170	1.010	1.330	1.210	.759	.612	.601	.545	.627	.988	.802	.973
Battle Creek	......	1.747	.....	‖‖	1.351	1.102	1.200	1.520	1.123	1.071	.899	.601	.....	.941	1.271	.883
Ann Arbor	1.140^{9}	1.696	1.450	.875	1.200	.965	1.277	1.210	.778	.601	.589	.521	.612	.976	.812	.954
Marshall	1.166^{8}	1.714	1.423	.866	1.294	.996	1.215	1.217	.791	.619	.556	.549	.684	.878	.690	.899
Albion	......	.....	1.424	.901	1.286	.978	1.215	1.236	.797	.831	.620	.530	.665	.965	.770	.922
Kalamazoo	......	1.771	1.401	.847	1.271	.935	1.175	1.231	.759	.614	.585	.536	.691	.795	.680	.890
Tecumseh	......	.....	.....	A	1.122	.972	1.262	1.196	.770	.576	.590	.510	.588	.....	.766	.956

§ Numbers in this column state the average monthly range of atmospheric pressure for a period of years ending in each case with Dec. 31, 1890. The small figures above and at the right of numbers which state the average, denote the number of years included in the average.

‖ Represents the difference between the highest of 10 stations and the lowest of 10 stations for year and for each month of year, not including the U. S. Signal Service Stations, Port Austin, Alma, Otsego, Battle Creek, Kalamazoo and Tecumseh.

¶ Represents sum of ranges at 10 stations divided by 10.

** An average for only the 6 U. S Signal Service Stations and Kalamazoo.

‡‡ The average for 8 months is .956. §§ For 11 months, .870. ¶¶ For 11 months, .830. ‖‖ For 11 months 1.067. A for 11 months, .846.

NOTE.—The *, †, ‡, and a b c references and the note to Table XV., page 76 apply also to Table XVI.

EXHIBIT 36.—*Average Atmospheric Pressure, by Year and Months in 1890, Compared with Annual and Monthly Averages for 1889, and for the 13 years, 1877-89. These Averages are for Groups of Several Stations in Michigan.*

Years, etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 13 years, 1877-89*	29.160	29.192	29.194	29.152	29.135	29.121	29.110	29.122	29.154	29.191	29.192	19.175	29.178
1889 (12 Stations)	29.128	29.068	29.177	29.089	29.116	29.060	29.100	39.104	29.192	29.131	29.228	29.135	29.141
1890 (12 Stations)	29.126	29.187	29.117	29.132	29.195	29.020	29.089	29.115	29.168	29.220	29.028	29.112	29.129
In 1890 Greater than Av. for 13 years, 1877-89	......	......	......	......	.060	......	......	......	.014	.029	......	......	......
In 1890 Less than Av. for 13 years, 1877-89	.034	.005	.077	.020	......	.101	.021	.007	......	......	.164	.063	.049
In 1890 Greater than in 1889	......	.119	......	.043	.079	......	......	.011	......	.089	......	......	......
In 1890 Less than in 1889	.002	......	.060	......	......	.040	.011	......	.024	......	.200	.023	.012

* Woodmere Cemetery (near Detroit) for 1877-79; Mendon for 1877-78, 1881-83; Benton Harbor for 1877-78; Ypsilanti for 1877, 1879; Otisville for 1878-80, 1882; Washington for 1879-80, 1882-3; Nirvana for 1879 and in 1880 to April 25 inclusive; Reed City for 1880 after April 25 and 1881-85; Hastings for 1882; Hillsdale for 1882-83; Manistique for 1884-85; Mackinaw City for 1884-87; Ionia for 1884-85; Swartz Creek for 1885; Port Austin for 1883-84, 1888-89; Marquette for 1879-84, 1886-87; Escanaba for 1880, 1882-87; Alpena, Grand Haven, Port Huron for 1879-87; Detroit for 1878-87; Kalamazoo for 1877-82, 1885-89; Tecumseh for 1879-80, 1882-85; Birmingham for 1887-89; Battle Creek for 1877-80, 1882, 1888-89; Lansing for 1879-89; Agricultural College for 1877, 1881-89; Thornville for 1880-81, 1884-89; Ann Arbor for 1881-89; Traverse City for 1882-89; Harrisville for 1882, 1885-89; Marshall for 1888-89; Gulliver Lake for 1888-89.

EXHIBIT 37.—*Comparisons of the Average Atmospheric Pressure during the Year and during each month of the Year 1890, with Averages for the 15 years, 1875-89, and for the Year 1889. Corrected for Temperature and for Instrumental Error. Observations made at 7 A. M., 2 P. M., and 9 P. M., daily, by Prof. R. C. Kedzie, at the State Agricultural College, near Lansing, Michigan.*

Years, etc.	Average Atmospheric Pressure.—Inches of Mercury.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 15 years, 1875-89	29.066	29.079	29.073	29.026	29.037	29.035	29.038	29.058	29.078	29.111	29.089	29.082	29.084
1889	29.062	28.995	29.091	29.011	29.061	28.996	29.037	29.057	29.141	29.070	29.157	29.061	29.063
1890	29.084	29.146	29.073	29.071	29.142	28.959	29.057	29.093	29.123	29.190	28.981	29.081	29.093
In 1890 Greater than Av. for 15 years, 1875-89	.018	.067	0	.045	.105	......	.019	.035	.045	.079	......	......	.009
In 1890 Less than Av. for 15 years, 1875-89	......	......	0	......	......	.076	......	......	......	......	.108	.001	......
In 1890 Greater than in 1889	.022	.251	......	.060	.081	......	.020	.036	......	.120	......	.020	.030
In 1890 Less than in 1889	......	......	.018	......	......	.037	......	......	.018	......	.176	......	......

EXHIBIT 38.—*Average Daily Range of Atmospheric Pressure, by Year and Months, in 1890, compared with Annual and Monthly Averages for 1889, and for the Eight years, 1882–89. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Average Daily Range of Barometer.—Year and Months, 1890.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 years, 1882-89*	.211	.317	.308	.260	.212	.160	.140	.120	.131	.167	.211	.249	.264
1889 (12 stations)	.201	.289	.249	.161	.233	.145	.133	.131	.115	.164	.211	.249	.331
1890 (12 stations)	.234	.400	.308	.256	.259	.195	.137	.136	.163	.167	.186	.287	.315
In 1889 Greater than Av. for 8 years, 1882-89	.023	.083	0	......	.047	.035	......	.016	.032	0	......	.038	.051
In 1889 Less than Av. for 8 years, 1882-89	......	......	0	.004	......	......	.003	......	......	0	.025	......	......
In 1890 Greater than in 1889	.033	.111	.059	.095	.026	.050	.004	.005	.048	.003	......	.038	......
In 1890 Less than in 1889	......	......	......	......	......	......	......	......	......	......	.025	......	.016

* Port Austin for 1883-84, 1888-89; Kalamazoo for 1886-89; Mackinaw City for 1884-87; Reed City for 1882-85; Washington, Mendon for 1888; Manistique, Ionia for 1884-85; Swartz Creek for 1885; Marquette for 1882-84, 1886-87; Escanaba, Grand Haven for 1882-87; Alpena, Port Huron, Detroit for 1883-87; Battle Creek for 1888-89; Traverse City, Lansing, Ann Arbor for 1882-89; Agricultural College, Marshall for 1883-89; Thornville for 1884-89; Harrisville for 1885-89; Birmingham for 1887-89; Gulliver Lake for 1888-89; Tecumseh for 1882-85.

EXHIBIT 39.—*Range of Atmospheric Pressure, by Year and Months, in 1890, compared with Annual and Monthly Averages for 1889, and for the Eight Years 1882–89. These Averages are for Groups of several Stations in Michigan.*

Years, etc.	Range of Barometer.—Year and Months, 1890.												
	Annual Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 8 years, 1882-89 *	.948	1.268	1.327	1.133	1.052	.750	.712	.550	.612	.828	.989	1.076	1.126
1889 (12 Stations)	.946	1.622	1.336	.759	1.016	.658	.790	.588	.520	.798	.898	1.187	1.180
1890 (10 Stations)	1.354	1.734	1.485	1.754	1.658	1.205	1.115	.987	.979	1.115	1.478	1.283	1.450
In 1890 Greater than Av. for 8 years, 1882-89	.406	.466	.158	.621	.606	.455	.403	.437	.367	.227	.489	.207	.324
In 1890 Less than Av. for 8 years, 1882-89	......	......	......	......	......	......	......	......	......	......	......	......	......
In 1890 Greater than in 1889	.408	.112	.149	.995	.642	.547	.325	.399	4.59	.317	.580	.096	.270
In 1890 Less than in 1889	......	......	......	......	......	......	......	......	......	......	......	......	......

* Reed City, Tecumseh for 1882-85; Port Austin for 1883-84, 1888-89; Washington, Mendon for 1888; Manistique, Ionia for 1884-85; Mackinaw City for 1884-87; Swartz Creek for 1885; Battle Creek for 1888-89; Marquette for 1882-84, 1886-87; Escanaba, Grand Haven for 1882-87; Alpena, Port Huron, Detroit 1883-87; Kalamazoo for 1888-89; Gulliver Lake for 1888-89; Traverse City, Lansing, Ann Arbor for 1882-89; Agricultural College, Marshall for 1883-89; Thornville for 1884-89; Harrisville for 1885-89; Birmingham for 1887-89.

TABLE XVII.—*Average Atmospheric Pressure for the Year, and for each Month in the Year 1890, at each of 19 Stations in Michigan; also Average lines for 12 Stations and for 7 Stations, as indicated by the height, in inches, of Mercury in the Barometer. Corrected for Temperature.—Reduced to 32° F. (for some Stations not corrected for Instrumental Errors*).—Average of Observations made Daily at 7 A. M., 2 P. M. and 9 P. M.,† by Observers‡ for the State Board of Health and for the U. S. Signal Service.*

Stations in Michigan.‡ (Those of the U. S. Signal Service in Italics.)	Divisions of the State.§	Inches of Mercury.—Atmospheric Pressure.													
		Years.		Months, 1890.											
		Norm.‖	1890.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. for 12 Stations ¶	....	....	29.125	29.187	29.108	29.132	29.195	29.020	29.089	29.115	29.168	29.220	29.028	29.112	29.129
Av. for 7 Stations **	....	....	29.279	29.350	29.278	29.289	29.357	29.174	29.235	29.256	29.309	29.370	29.185	29.265	29.286
Marquette *	U. P.	....	29.193	29.261	29.177	29.203	29.292	29.105	29.145	29.156	29.228	29.265	29.122	29.171	29.191
Gulliver Lake	U. P.	29,306 3	29.304	29.358	29.300	29.321	29.407	29.208	29.262	29.279	29.346	29.389	29.222	29.276	29.284
Manistee. *	N. W.	....	29.354	29.414	29.347	29.370	29.432	29.238	29.298	29.331	29.385	29.443	29.263	29.349	29.376
Traverse City	N. W.	29,384 9	29.319	29.389	29.319	29.345	29.399	29.221	29.235	29.289	29.350	29.407	29.250	29.303	29.320
Alpena	N. E.	....	29.343	29.406	29.346	29.360	29.441	29.250	29.308	29.315	29.375	29.444	29.261	29.328	29.358
Harrisville	N. E.	29,312 6	29.311	29.363	29.294	29.315	29.397	29.228	29.276	29.294	29.356	29.407	29.219	29.279	29.299
Grand Haven	W.	....	29.351	29.424	29.349	29.369	29.417	29.232	29.298	29.330	29.380	29.438	29.254	29.349	29.377
Port Austin	B. & E.	....	††	a29.439	f 29.368	29.341	f 29.439	c29.239	f 29.314	g29.325	j 29.372	....	....	....	....
Port Huron *	B. & E.	....	29.357	29.435	29.353	29.355	29.429	29.251	29.319	29.339	29.381	29.453	29.246	29.354	29.365
Thornville	B. & E.	28,954 11	28.949	29.008	28.931	28.912	29.025	28.853	28.923	28.948	28.991	29.059	28.836	28.927	28.952
Alma	C.	....	29.197	29.246	d29.158	29.199	29.261	29.080	i 29.168	29.206	a29.281	29.306	29.088	29.160	k29.210
Agricultural College *	C.	29,088 9	29.084	29.146	29.073	29.071	29.142	28.959	29.057	29.093	29.123	29.190	28.981	29.081	29.093
Lansing, S. B. of H.	C.	29,055 12	29.084	29.123	29.045	29.083	29.162	28.982	29.058	29.088	29.131	29.186	28.984	29.074	29.091
Otsego	S. W.	....	‡‡	....	29.248	29.237	29.283	29.112	29.185	29.212	29.248	29.314	29.121	29.227	29.259
Albion	S. C.	....	28.953	29.026	28.939	28.955	29.016	28.852	28.925	a28.942	a28.988	29.049	28.834	28.947	28.963
Ann Arbor	S. C.	29,032 10	29.083	29.104	29.018	29.027	29.099	28.928	29.004	29.020	29.065	29.129	28.944	29.022	29.041
Battle Creek	S. C.	....	§§	29.148	29.103	29.089	29.189	29.002	b29.184	29.117	a29.183	....	29.117	29.156	29.077
Kalamazoo	S. C.	....	29.034	29.103	29.013	29.036	29.091	28.924	28.996	29.015	29.072	29.130	28.937	29.089	29.054
Marshall	S. C.	29,029 8	29.014	29.086	28.993	29.018	29.068	28.906	28.983	29.004	29.051	29.105	28.910	29.015	29.034
Tecumseh	S. C.	....	29.127	29.203	29.107	l 29.186	29.173	29.018	29.083	29.107	29.142	29.203	j 29.031	e 29.148	29.130
Birmingham	S. E.	29,115 4	29.129	a29.196	d29.124	29.126	29.195	b29.015	c29.093	a29.113	h29.195	29.215	a29.033	29.109	29.134
Detroit *	S. E.	....	29.315	29.409	29.326	29.329	29.395	29.219	29.282	29.303	29.347	29.415	29.215	29.264	29.278

* For stations marked thus * a correction has been made for instrumental error, as follows: For Marquette, .004 added for Jan. and Feb.—.001, Mar. to Dec.; for Alpena, .006 added; Grand Haven barometer has no instrumental error; for Port Huron, .005 substracted; for Detroit, .001 added for Jan., Mar., May to Dec.; for Agricultural College, .013 substracted; for Manistee, .004 added. For other stations the instrumental error of barometer is not known.

† At the stations of the U. S. Signal Service during the year 1890, the observations were made at 8 A. M. and 8 P. M., 75th meridian time. The corresponding local time for each of these stations is stated in the star (*) foot-note to Table I., page 23.

‡ The names of observers their places of observation, and the counties in which these places are situated, are stated in Exhibit 1, page 2.

§ The full names of divisions and the counties in each division are stated in Exhibit I., in a paper which follows on weekly reports of sickness.

‖ Numbers in this column state the average annual atmospheric pressure for periods of years ending in each case with Dec. 31, 1890. The small figures at the right of the numbers which state the average, denote the number of years included in the average.

¶ This line is an average for 12 stations, at which observations were made tri-daily, and from which reports, nearly complete, were received for every month in the year. It does not include Port Austin, Otsego, Battle Creek, Kalamazoo and the U. S. Signal Service Stations. Green's standard barometer was used at all the 19 stations for 1890.

** This is an average line for the 6 U. S. Signal Service Stations and Kalamazoo.

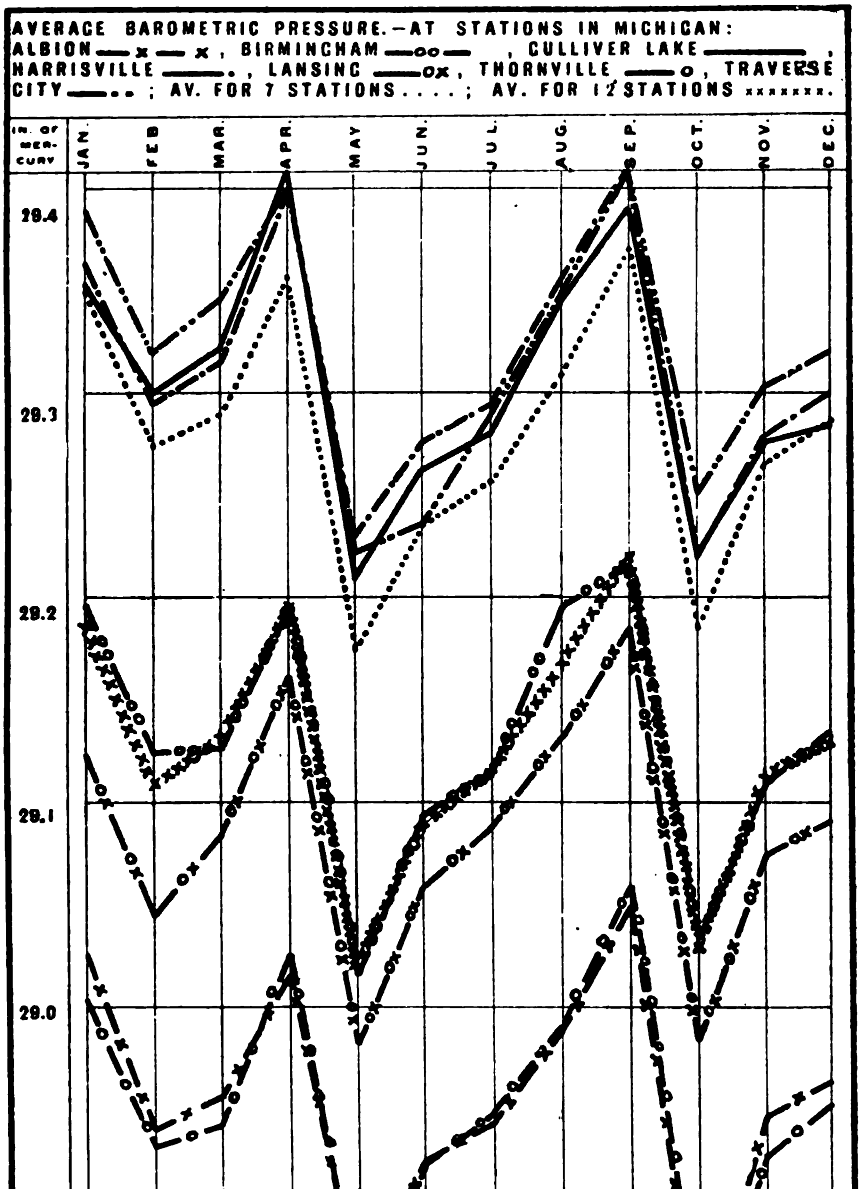
†† The average for 8 months is 29.355. ‡‡ For 11 months, 29.222. §§ For 11 months, 29.124.

NOTE.—Computations of monthly averages for the year 1890 were furnished by the observers at Alpena, Grand Haven, Port Huron, Detroit, Marquette, Albion, Ann Arbor and Manistee. The remainder of the computations were made at the office of the State Board of Health.

a For 30 days. b For 29 days. c For 28 days. d For 27 days. e For 26 days. f For 25 days. g For 24 days. h For 23 days. i For 22 days.
j For 21 days. k For 19 days. l For 18 days.

The lines for 7 stations in this table are graphically represented in Diagram XVI., page 81.

DIAGRAM XVI.—ATMOSPHERIC PRESSURE, BY MONTHS IN 1890



THE TIME OF GREATEST PREVALENCE OF EACH DISEASE.

CONTRIBUTIONS TO THE STUDY OF THE CAUSES OF SICKNESS.

A STATISTICAL REPORT BASED ON WEEKLY REPORTS OF SICKNESS IN MICHIGAN DURING THE YEAR 1890 AND PRECEDING YEARS.

BY THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper is the fourteenth in a series of articles upon the same general subject, begun in the latter part of 1876. It presents a summary of the compilation of weekly reports of sickness in Michigan in 1890. It includes a series of diagrams or graphic illustrations which show by months in 1890, the rise and fall of twenty-eight of the most prominent diseases in Michigan.

Propositions are stated as to the relations of specified meteorological conditions, and diseases are mentioned under these propositions in such manner as to suggest one method of studying some of the facts brought out in the compilation.

Tables are given showing the per cent of the weekly *reports* which stated the presence of the various diseases, first (in Exhibit IV.), for each of the years 1877–1890, and an average for 1877–1889; and secondly (in Exhibit IV. continued), by months, in the year 1890, in each of the years 1888–9, and the average for the period of years 1877–89, the diseases being arranged in the order of their greatest reported prevalence in 1890, to facilitate a comparison with the prevalence of the same diseases in previous years, and in corresponding months in previous years.

The per cent of *observers* stating the presence of each of the diseases is given in Table 1, for the year 1890, and, for comparison, for each of the years 1877–1889, and, in Table 1 continued, for the months in the year 1890, and, for comparison, by months in each of the years 1888–9, and the average by months for the period 1877–89.

Comparing Table 1, with Exhibit IV., we see the correspondence in the two lines of evidence,—that of the "prevalence" of the diseases as shown by the per cent of *reports*, and the "area of prevalence" as shown by the per cent of *observers*, the diseases following each other in a somewhat similar order from highest to lowest—the diseases being arranged in the table, as in the exhibit, in the order of their greatest reported prevalence in 1890.

One of the objects of this compilation is to learn the time of the greatest and of the least prevalence of each of the most important diseases in the State, and to note the connection of this prevalence with each of the meteorological conditions in the State. Casual observation shows that certain diseases are much more prevalent in the hot months, while certain other diseases are much more prevalent in the cold months. The relation between these diseases and the atmospheric temperature is well marked, but accurate statistics are needed to show just what that relation is. We find, also, that other meteorological conditions than atmospheric temperature have a marked effect upon many of the diseases, apparently diminishing the effect of temperature in some instances, increasing its effect in other instances. For this reason, and for other reasons, the State Board of Health undertakes by a compilation of the weekly reports of sickness in connection with the various meteorological conditions, to learn what causal relations exist between the humidity of the air, the ozone, the velocity of the wind, the atmospheric pressure, etc., and the increased or diminished prevalence of diseases in certain months as compared with other months in the same year, or with the same months in other years or series of years.

Since 1876, when this system of "weekly reports of sickness" was begun, an important work has been accomplished in learning the time of the greatest prevalence of each of several of the most important diseases, and consequently the time of greatest danger from each such disease in the State considered as a unit. To facilitate the study of the causes of sickness and deaths, the State is divided into eleven geographical divisions, a list of which, and the counties embraced in each, appear in Exhibit L, page 89. From some of these divisions sufficient data are not yet received to make the study of the comparative prevalence of diseases in different parts of the State practicable. The number of reports from localities in the newer parts of the State is increasing, however, and a comparison of sickness by localities may become practicable in the near future.

PHYSICIANS' WEEKLY REPORTS OF SICKNESS.

Weekly reports are now received concerning twenty-eight diseases, the names of which are printed on the blank postal used for the weekly report, and concerning these twenty-eight diseases a positive report is made each week by many of the leading physicians in Michigan.

Great credit is due the busy medical practitioners in Michigan who forward these reports of sickness. Some of them have made the reports regularly since this plan was adopted in 1876. The service is, as a rule, without compensation; possibly a few health officers may have slight pay from their local boards of health. No other class of persons, however, has knowledge of the facts that are necessary in the compilation of health statistics; and it is greatly to the credit of physicians that they are so willing to coöperate in every effort made to advance the public health.

PLAN OF THE WEEKLY CARD-REPORTS.

The plan of the weekly reports remains the same as last year. (Cards having *Pleuritis* printed on them were first used for weekly reports in October, 1887.) Observers now report only the diseases under their own personal observation. Previous to the year 1885, some of the observers reported such diseases as they believed to be present in their locality, even though not under their own observation. The change in method of making the reports may account partially for the apparent decrease in sickness in 1890, when compared with the average for the thirteen years, 1877-89.

Details of the method of securing and the plan of marking these reports may be thus stated:—

The blanks for the weekly reports are printed on postal cards, which are supplied to the observers of diseases. Blank record books in which to preserve copies of the reports, remarks, etc., are also supplied to these observers, to be retained by them. The reports are forwarded weekly to the Secretary of the State Board of Health, at Lansing

The plan of making the report is as follows: Each observer is requested to mark the disease of which there was the greatest number of cases under his observation during the week for which the report is made, 1; that of which there was the next greatest number of cases, 2; the next, 3; and so on, applying *consecutive* numbers to the diseases reported present; but marking with the *same* figure all diseases of which there is the same number of cases; to write 0 opposite each disease mentioned of which there was no case; to apply these numbers without regard to the severity of the cases; to include all cases, without regard to when they were taken sick, so long as they are actually sick with the given disease; to include all cases "under the observation" of the observer. A blank is left on the card for the convenience of those observers who prefer to state the number of cases rather than the order of prevalence by the foregoing method.

To illustrate the method of making the reports, the following copy of one of the blanks now in use is given, correctly marked, in the "prevalence" column, for the number of cases stated on the right-hand margin. It should be remembered that the numbers in the "prevalence" column denote simply the relative order in which the several diseases appear to be prevalent, and do not denote a definite number of cases; so that a disease might one week be maked *4*, and the following week, with the same number of cases, be marked *1*. Names of diseases and figures printed in italics are not *printed* on the postal blanks, but are supposed to have been *written* on the report by the observer.

Diseases in .... [and vicinity?]
☞ PLEASE DATE. ☜

week ending Sat., ..., *189*...

....

ED. 30.

a. Please mark the disease of which there is the greatest number of cases, 1; the disease having next greatest number of cases, 2; the next, 3; and so on for each disease, writing the same figures opposite diseases having the same number of cases. Write 0 opposite each disease of which there is no case under your observation. [For full statement of plan, see second, third, and fourth pages of record-book cover.] A blank indicates that the item has been overlooked. Please mail this, ☞ signed and dated, ☜ as soon as convenient after close of week specified.

	Prevalence. Order. See a.	*Cases.*
Brain, Inflammation of....	*14*	*1*
Bowels, Inflammation of ..	*12*	*3*
Bronchitis..................	*11*	*4*
Cerebro-spinal Meningitis.	*0*	*0*
Cholera Infantum..........	*8*	*9*
Cholera Morbus............	*10*	*6*
Consumption, Pulmonary..	*10*	*6*
Croup, Membranous	*12*	*3*
Diphtheria	*5*	*14*
Diarrhea	*3*	*17*
Dysentery	*8*	*9*
Erysipelas..................	*13*	*2*
Fever, Intermittent.........	*2*	*21*
Fever, Remittent	*11*	*4*
Fever, Typhoid (Enteric)..	*0*	*0*
Fever, Typho-malarial	*9*	*7*
Influenza....................	*7*	*11*
Kidney, Inflammation of..	*14*	*1*
Measles	*1*	*27*
Neuralgia	*14*	*1*
Pleuritis....................	*0*	*0*
Pneumonia..................	*9*	*7*
Puerperal Fever............	*0*	*0*
Rheumatism	*6*	*12*
Scarlatina..................	*4*	*16*
Small-pox	*0*	*0*
Tonsillitis..................	*11*	*4*
Whooping-cough...........	*0*	*0*
Mumps	*6*	*12*
Dyspepsia	*11*	*4*
....	......	......

This report is of diseases UNDER YOUR OBSERVATION; if it includes a contagious disease, please mention, on the bottom or margin of this card, the township, city, or village in which the disease is. ☞

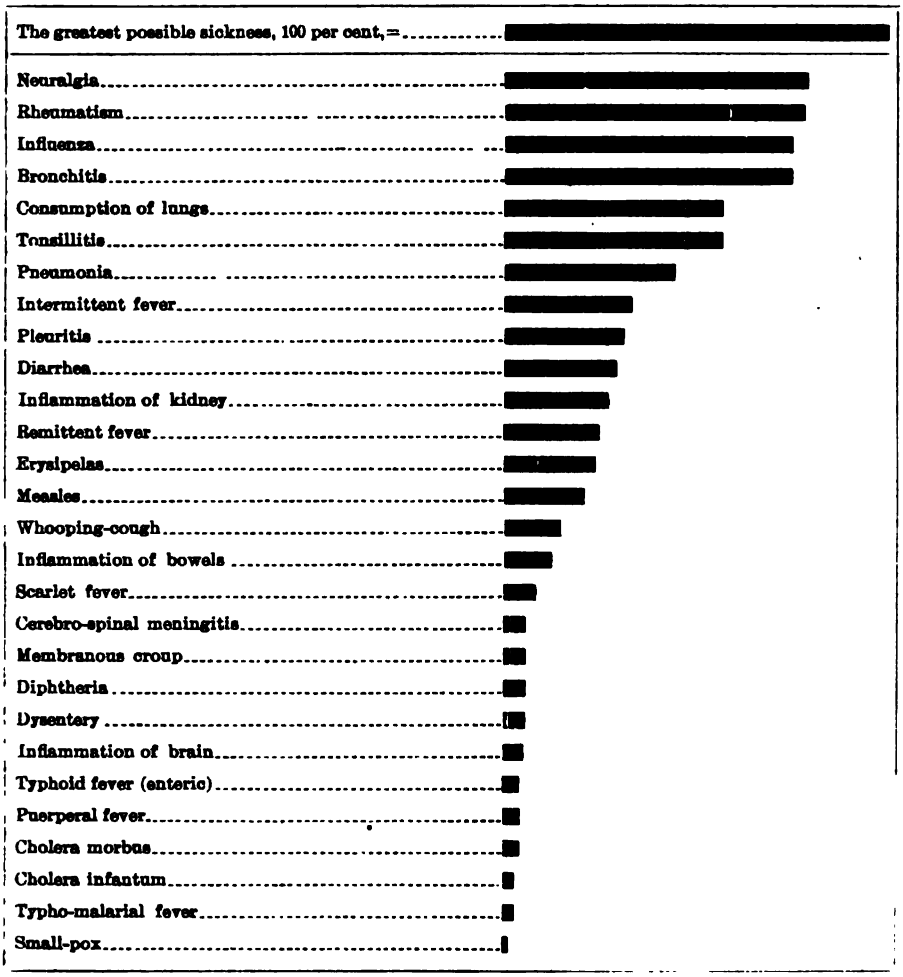
...., M. D.

DIAGRAMS GRAPHICALLY EXHIBITING COMPARATIVE SICKNESS FROM EACH DISEASE.

During the year 1890, diagrams showing the comparative sickness in Michigan were issued each month, and copies mailed with the monthly bulletin. It was thought that newspapers or medical or sanitary periodicals might publish them. A few periodicals did publish them, but so few that the issuing of the diagram was discontinued. A sample of the diagram is as follows:—

HEALTH IN MICHIGAN, MARCH, 1890.

The Secretary of the Michigan State Board of Health says, that the weekly reports indicate Comparative Sickness in Michigan during March, 1890, from each of the important diseases as follows:—



BULLETINS OF HEALTH IN MICHIGAN.

During the year 1890 the issue of weekly and monthly bulletins of "Health in Michigan" has been continued. The weekly bulletin is compiled from the physicians' weekly reports from all parts of the State. It is designed to give, each week, information to the public concerning the diseases which cause most sickness in the State, the relative amount of sickness compared with the corresponding week in previous years, and compared with the preceding week—thus showing any sudden increase or decrease which may have occurred in the prevalence of any disease, together with a similar comparison of the various meteorological conditions; also, a list of the localities in which each of the dangerous communicable diseases is reported present. If the newspapers would publish the localities where dangerous diseases are, the information would be valuable to parents who might thus be enabled to avoid taking their children to such places until after the disease had ceased and thorough disinfection had occurred. A copy of this bulletin has been sent to such editors as have expressed a desire to have it for use, entire or in part, in their papers. About forty copies are now used for this purpose each week. An abstract of it also goes to the Michigan Associated Press. The monthly bulletin is similar in character to the weekly bulletin. It is issued as soon as possible after the close of each month, and it is sent to the sanitary and medical journals which are received as exchanges by the library of the State Board of Health. About ninety copies are thus used at the present time.

As a rule, about three-fourths of the card reports reach the office of the State Board of Health in time for compilation in the weekly bulletin, and the monthly bulletins are compiled from the information used in the weekly bulletin. It is found that the statements made in the monthly bulletins are corroborated by the information obtained after the close of the year, in the compilation of the whole number of the reports for the corresponding months of the year.

COMPILATION OF THE WEEKLY REPORTS.

The reports from each locality are compiled by months. The average of the numbers stating the order of prevalence of the several diseases for the month is considered an indication of the actual order of the prevalence of the diseases for that time. There is also found for each locality what per cent of the reports state the presence of each disease for the given month. This per cent of reports for a single locality indicates what part of the month the disease was present in that locality. It may also be called the per cent of weeks the disease was present. These first results of the compilation are stated in Table 3, which, on account of the space required, has not been printed in the Reports since that of 1882, but is preserved in the office of the State Board for reference and study.

A combination of the statements for localities in Table 3, is made by months for the State, so far as it is represented by the localities from which reports are received, showing: (1) What per cent of the observers reported each disease each month; (2) for the localities at which a given disease was reported, an average of the per cent of weeks it was reported at those localities; (3) what per cent of all the reports received for the month stated the presence of each disease; (4) an average of the numbers denoting the order of prevalence of each disease at the localities at which it was reported present during the month.

THE PREVALENCE OF THE SEVERAL DISEASES IN 1890.

By noting the per cent of all the reports received for a given time which stated the presence of each disease, the relative prevalence of the several diseases may be readily seen. This per cent has been computed for each disease, by months, for the year 1890. It is thus stated in Exhibit II., page 90, which also states the per cent for each disease for the year 1890, and an average for the period of thirteen years, 1877-89. What per cent of the reports stated the presence of each disease by months in 1890, is graphically represented in Diagrams 1-5 on page 91, and following pages.

For eighteen diseases a comparison has been made of the amount of sickness in 1890 (as indicated by the proportion of reports stating the presence of the disease) with the average amount for a period of thirteen years. These comparisons are shown in Exhibits XI., XIII., XVIII. and XX. A comparison is made in Table 1, page 99, between the per cent of observers reporting the tabulated diseases present in each of the years 1877-1890, and by months in three of those years; also an average by months for the period of thirteen years, 1877-89. In Exhibit IV., on pages 93 and 94, the per cents of reports stating the presence of each of the twenty-eight tabulated diseases, by months, for each of the years 1888-90, and an average by months for the period of thirteen years, 1877-89, is given. In Table 1, and in Exhibit IV., the diseases are arranged in the order of the greatest per cents for 1890, the highest being placed first.

A study of the reported sickness from twenty-eight diseases, in connection with the meteorological conditions by months in 1890, is made in Exhibit X., and following exhibits. By arranging months in order of greatest prevalence of the disease under consideration, noting whether it is more or less prevalent than the average for the year, and noting what were the meteorological conditions for the same months as compared with the average for the year, relations and comparisons are grouped for convenient comparison. A summary of one line of the evidence presented by these exhibits is given in Exhibits XXIV. and XXV.

In Exhibits VI. and VII., on subsequent pages, the leading diseases are arranged in order according to the amount of sickness reported from them in 1890, those from which there was most sickness reported being placed first. In these exhibits the diseases are arranged with reference to the per cent of reports taken in connection with the average order of prevalence.

The comparison with former years is facilitated by reference to Exhibit II., page 90, Table 1, pages 99, 100 and 101; Exhibit IV., pages 93, 94 and 95, and Exhibits XI., XIII., XVIII. and XX.

Exhibit IV., on pages 93, 94 and 95, is continued for 1890. In it the diseases are arranged in order of the greatest per cent of reports stating the presence of the diseases in 1890, the highest per cent being placed first in the line. It is similar in form to Table 1., page 99, which shows the per cent of observers by whom diseases were reported present. It affords a means of comparing the diseases showing greatest prevalence with those showing greatest area of prevalence or widest distribution. It affords also a means for the comparison of per cent of reports in 1890, with the average per cent of reports in the thirteen years, 1877-1889, both for the year and by months, also by months in 1890, with several of the years previous to 1890.

DISEASES FROM WHICH THERE WAS A MARKED INCREASE OR DECREASE IN PREVALENCE IN MICHIGAN IN 1890.

By referring to Exhibits II. and IV., it will be seen that influenza was the only disease which showed a marked increase in 1890 over the average for the thirteen years, 1877-89. The diseases in which the decrease in 1890 appears most marked are small-pox, typho-malarial fever, diphtheria, whooping-cough, remittent fever, intermittent fever, scarlet fever, typhoid fever, membranous croup and cerebro-spinal meningitis.

A part of the lessened prevalence of some of the prominent diseases may be due to the change in the method of reporting sickness, referred to in the last paragraph on page 83.

A comparison of 1890 with the average for the four years 1886-9, shows that influenza was the only disease in which there was a marked increase in 1890; and that typho-malarial fever and whooping-cough are the only diseases in which there was a marked decrease in 1890.

Change in Method of Comparison of Diseases by Years.

In former Reports, ending with the Report of 1888, mention has been made of diseases in which a difference of seven or more was shown between the per cents of reports stating the presence of the disease in the current year and in the preceding year or term of years; now, in this and in the last two preceding Reports those diseases are mentioned of which the comparison shows an increase or decrease of twenty-five per cent from the preceding year, or from the normal, as the case may be.

In Exhibits XI., XIII., XVIII., and XX., the per cent of reports by months in 1890 is placed directly under the per cents for the corresponding months in 1889. A comparison between the corresponding months in the two years is thus made possible, and the comparison of the months in 1890 with the averages for the months in the series of years preceding is made possible by placing the differences, greater or less, in separate lines; and a comparison of the months in 1890 with the averages for the months in the series of four years 1886-9 is shown by placing the differences, greater or less, in separate lines. But in order to make a proper comparison, the increase or decrease by per cent of difference from the preceding year or series of years should be computed.

EXHIBIT 1.—*Eleven Geographical Divisions of the State, formed for the purpose of facilitating the Study of Causes of Sickness and of Death, with a list of Counties included in each Division.*

1.—Upper Peninsular.	2.—Northwestern.	3.—Northern.	4.—Northeastern.	5.—Western.	6.—Northern Central.	7.—Bay and Eastern.	8.—Central.	9.—Southwestern.	10.—Southern-Central.	11.—Southeastern.
Alger.	Benzie.	Antrim.	Alcona.	Kent.	Clare.	Arenac.	Barry.	Allegan.	Branch.	Macomb.
Baraga.	Gr. Traverse.	Charlevoix.	Alpena.	Lake.	Gladwin.	Bay.	Clinton.	Berrien.	Calhoun.	Monroe.
Chippewa.	Leelanaw.	Cheboygan.	Iosco.	Mason.	Isabella.	Huron.	Eaton.	Cass.	Hillsdale.	Oakland.
Delta.	Manistee.	Crawford.	Montmorency.	Muskegon.	Mecosta.	Lapeer.	Genesee.	Van Buren.	Jackson.	Wayne.
Dickinson.	Manitou.	Emmet.	Ogemaw.	Newaygo.	Midland.	Saginaw.	Gratiot.		Kalamazoo.	
Gogebic.	Wexford.	Kalkaska.	Oscoda.	Oceana.	Roscommon.	Sanilac.	Ingham.		Lenawee.	
Houghton.		Otsego.	Presque Isle.	Ottawa.	Missaukee.	St. Clair.	Ionia.		St. Joseph.	
Iron.					Osceola.	Tuscola.	Livingston.		Washtenaw.	
Isle Royal.							Montcalm.			
Keweenaw.							Shiawassee.			
Luce.										
Mackinac.										
Marquette.										
Menominee.										
Ontonagon.										
Schoolcraft.										

On pages 230 and 253 of the Report of this Board for 1885, the divisions and the counties in each were indicated by lines on maps of the State. Similar maps appear in the articles on diphtheria and scarlet fever near the end of the present Report.

EXHIBIT II.—*Stating for each of 28 Diseases for the Year ending Saturday, January 3, 1891, by Months of the Year 1890, and the average for the period of thirteen years, 1877-1889, on what Per Cent of the reports received each Disease was stated to be present.—Compiled from weekly reports by Health Officers of Cities and Villages, by Regular Correspondents of the State Board of Health, and by other physicians.*[*]

Diseases.	Average, 1877-89.	What Per Cent of the Reports received stated the Presence of the Disease.												
		Year 1890.	Months, 1890.											
			Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average†	28	25	26	26	25	26	25	23	24	27	26	25	25	27
Brain, Inflammation of	6	5	4	5	4	5	5	5	6	5	3	5	4	5
Bowels, Inflammation of	15	14	10	13	11	13	12	15	15	22	16	11	9	14
Bronchitis	60	65	71	74	76	74	66	56	50	52	54	65	73	79
Cerebro-spinal meningitis	4	3	2	5	5	4	4	3	3	2	3	2	3	3
Cholera Infantum	18	10	1	0.8	1	1	3	7	23	43	26	8	3	3
Cholera Morbus	18	15	1	3	2	3	4	11	37	54	34	11	6	5
Consumption, Pulmonary	61	52	50	53	55	61	57	52	45	50	51	51	49	55
Croup, Membranous	6	4	4	3	4	5	4	3	2	2	2	5	6	9
Diphtheria	18	8	9	9	6	5	8	5	6	6	7	9	11	10
Diarrhea	46	44	27	28	31	28	29	42	68	82	71	54	31	27
Dysentery	19	16	6	7	6	6	8	13	23	41	40	18	9	7
Erysipelas	23	21	23	23	21	24	28	25	21	16	19	21	19	23
Fever, Intermittent	66	41	33	33	33	40	40	43	44	48	43	45	44	36
Fever, Remittent	44	27	22	19	20	28	26	26	30	33	31	31	33	29
Fever, Typhoid (enteric)	12	8	6	1	3	2	2	5	6	15	15	16	18	7
Fever, Typho-malarial	20	7	4	2	2	5	6	3	6	14	12	12	7	6
Influenza	38	53	92	95	78	53	44	30	24	25	41	49	56	69
Kidney, inflammation of	20	21	17	22	22	29	25	21	20	17	18	19	24	23
Measles	12	12	12	19	19	21	22	22	16	5	3	4	4	7
Neuralgia	66	67	68	72	73	75	70	65	61	61	64	65	66	71
Pleuritis	18	19	25	26	29	22	22	14	18	13	14	14	15	31
Pneumonia	35	30	58	59	44	40	30	14	13	10	14	19	25	39
Puerperal Fever	5	4	5	5	3	5	6	4	3	1	2	2	2	5
Rheumatism	68	71	78	69	72	79	78	70	68	62	71	68	74	75
Scarlatina	16	10	8	8	9	8	8	9	7	8	7	14	16	12
Small-pox	0.9	0.1	0	1	0.3	0	0	0	0	0	0	0	0	0
Tonsillitis	48	50	57	56	55	53	55	41	38	37	41	51	55	61
Whooping-cough	19	9	10	13	12	13	15	9	12	10	6	3	5	5
No. of reports received	4,358	4,939	425	348	346	363	371	383	486	409	435	501	408	464

[*] For 1890 the names of observers are stated in Exhibit V., pages 96, 97 and 98.

† This line is an average for such of the tabulated diseases as were reported present in the given month or year.

Statements in this exhibit for months in 1890 are graphically represented in Diagrams 1, 2, 3, 4, 5, opposite this page and on following pages.

DIAGRAM I.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1890.

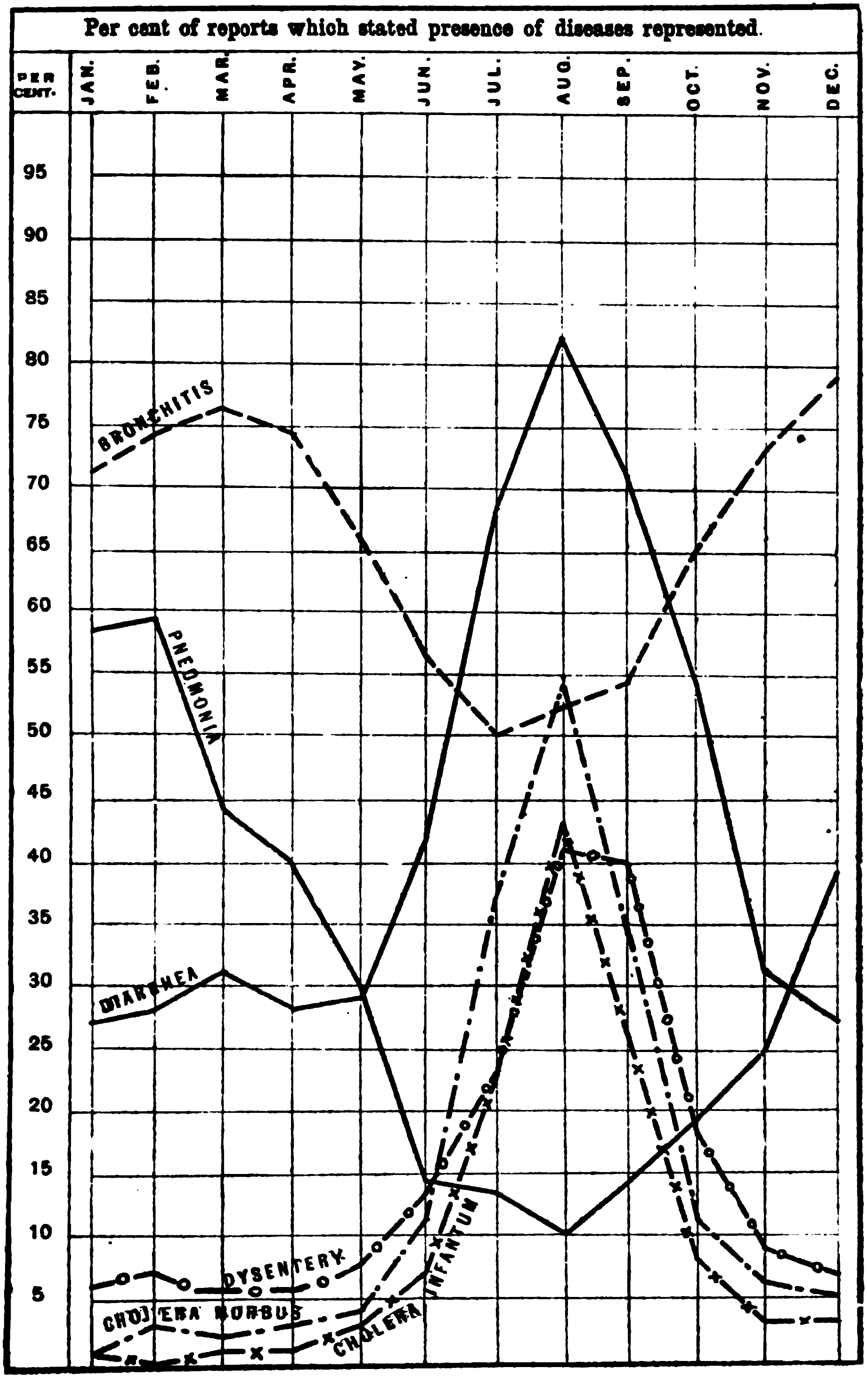


EXHIBIT III.—*Stating, by months of the Year, ending Saturday, January 3, 1891, for the State, and for each of the Eleven Geographical Divisions of Michigan, from which Weekly Reports of Diseases were received, the Number of Observers from whom the Reports were received, the Number of Reports received, the day on which, for the purposes of this compilation, each month is made to end, and the Number of Weeks thus included in each month.*

Months, 1890.	Months and Year End Saturday.	Number of weeks.	State.		Divisions of the State.*																					
					1. Upper Peninsula.*		2. Northwestern.*		3. Northern.*		4. Northeastern.*		5. Western.*		6. Northern Central.*		7. Bay and Eastern.*		8. Central.*		9. Southwestern.*		10. Southern Central.*		11. Southeastern.*	
			Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†	Observers.‡	Reports.†
Year, 1890‡	Jan. 3, 1891	53	155	4,939	11	296	6	173	2	52	4	101	14	450	5	108	20	618	31	976	17	523	24	878	21	764
Av. per month	....	....	102	412	6	25	4	14	1	4	2	8	9	38	2	9	13	52	21	81	11	44	18	73	15	64
January	February 1	5	88	425	5	23	4	19	1	5	2	10	10	50	3	15	11	51	15	71	10	47	15	74	12	60
February	March 1	4	92	318	5	20	4	13	1	4	3	10	10	38	3	12	11	40	18	68	10	38	15	57	12	48
March	March 29	4	90	346	6	28	4	16	1	4	2	8	10	39	3	12	11	42	17	63	10	37	14	55	12	47
April	May 3	5	79	363	4	15	4	14	1	5	2	10	7	32	1	5	11	48	16	78	7	34	14	67	12	60
May	May 31	4	102	371	6	21	4	16	1	4	2	8	8	30	1	4	15	55	20	74	10	37	20	69	15	55
June	June 28	4	106	383	7	23	4	16	2	6	1	4	9	35	2	7	16	58	21	74	10	37	17	59	17	64
July	August 2	5	108	486	5	22	3	12	1	4	1	5	10	48	3	12	17	77	26	112	11	52	16	78	15	69
August	August 30	4	115	409	7	25	3	12	1	2	1	4	9	35	3	10	19	65	25	87	13	46	19	66	15	57
September	September 27	4	123	435	9	30	3	11	2	5	3	8	9	34	3	11	16	58	26	92	12	41	21	76	19	69
October	November 1	5	109	501	8	33	4	17	1	5	3	12	8	34	1	5	11	46	22	101	11	55	22	104	18	84
November	November 29	4	113	408	8	28	4	14	1	3	3	10	9	34	2	7	11	39	22	78	11	41	23	84	19	70
December	Jan. 3, 1891	5	101	464	6	28	3	13	1	5	3	12	9	41	2	8	9	39	18	83	12	58	21	96	17	81

* The counties in each division are given in Exhibit I., page 89. † From some of the observers reports were not received for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks in the given month or in the year.

‡ In some localities there were more observers than one. The whole number of localities from which reports were received was 138; the average number per month was 98. The names of observers and number of cards received from each observer for each month and for the year are stated in Exhibit V., pages 96, 97, 98.

EXHIBIT IV.—*Stating for each of 28 Diseases for the period of Thirteen Years ending Saturday, December 28, 1889, and for each of those Years and 1890, on what Per Cent of the Reports received the Diseases were stated to be present. Compiled from Weekly Reports by Health Officers of Cities and Villages and by regular Correspondents of the State Board of Health.** *(Continued for each month of several of the above-mentioned years on pages 94 and 95.)*

Line Number.	Diseases.	What per cent of the Reports stated the Presence of the Disease.														
		Average 1877-89.	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Average Disease†	28	25	23	24	25	26	26	29	30	30	33	32	33	30	28
1	Rheumatism	68	71	65	66	69	70	68	70	68	68	71	71	72	68	60
2	Neuralgia ‡	66	67	63	62	67	67	68	70	69	68	65	64	59	-----	-----
3	Bronchitis	60	65	58	59	55	56	56	61	66	65	62	64	64	64	55
4	Influenza	38	53	32	32	33	35	34	41	43	40	35	42	45	44	41
5	Consumption, Pul.‡	61	52	48	49	51	55	58	63	61	66	71	68	70	71	-----
6	Tonsillitis‡	48	50	46	41	47	49	50	50	50	48	48	49	45	-----	-----
7	Diarrhea	46	44	45	41	48	45	46	52	49	48	52	47	48	41	41
8	Intermittent Fever	66	41	43	45	48	54	59	65	69	71	82	82	82	82	75
9	Pneumonia	35	30	26	30	28	27	27	29	38	39	41	42	41	41	40
10	Remittent Fever‡	44	27	30	34	32	34	36	44	41	48	54	56	57	58	52
11	Erysipelas	23	21	22	24	24	23	24	26	25	22	23	25	25	21	20
12	Inflam. of Kidney‡	20	21	20	19	18	20	21	26	-----	-----	-----	-----	-----	-----	-----
13	Pleuritis ‡	18	19	17	18	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
14	Dysentery	19	16	17	17	19	17	15	23	21	17	23	18	18	19	21
15	Cholera morbus	18	15	14	15	19	17	17	22	18	17	26	20	19	14	15
16	Inflam. of bowels ‡	15	14	14	14	16	17	17	17	16	13	14	12	-----	-----	-----
17	Measles	12	12	6	16	14	6	5	10	24	11	26	19	12	5	7
18	Cholera infantum	13	10	11	11	13	14	11	15	14	13	18	14	14	11	11
19	Scarlet Fever	16	10	10	9	8	11	12	16	19	18	19	15	23	25	21
20	Whooping-cough	19	9	16	9	14	20	14	23	15	17	16	32	23	21	21
21	Diphtheria	18	8	6	7	10	13	14	15	17	25	34	27	29	23	19
22	Typhoid Fever (ent.)	12	8	10	10	10	8	8	12	11	14	18	14	12	10	14
23	Typho-mal. Fever‡	20	7	16	15	16	16	16	20	18	24	29	24	22	24	26
24	Inflam. of brain‡	6	5	5	5	6	5	6	7	6	5	5	6	-----	-----	-----
25	Membranous croup	6	4	3	4	4	5	5	6	6	7	9	6	7	7	6
26	Puerperal Fever	5	4	5	4	6	5	6	7	7	7	5	3	3	3	4
27	Cer.-Spinal Men.	4	3	3	3	3	4	6	7	5	6	9	2	2	2	3
28	Small-pox	0.9	0.1	.03	.03	.02	0.4	0.2	0.1	0.3	3	2	0.4	0.4	0.2	4
	No. of reports rec'd	4,365	4,939	5,000	5,047	4,896	5,683	5,108	3,957	4,458	4,745	3,567	3,991	3,755	3,221	3,320

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* For 1890 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 92, the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 96, 97, 98.

† The numbers opposite the names of the diseases do not state what per cent of the whole number of reports for the year stated the disease to be present at some time during the year, but state (on an average for twelve months of the year), what per cent of reports for the several months stated the disease to be present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the reports for that month (the number of which is stated at the foot of the column) stated the given disease to be present in that month. [‡ For foot-note see page 98.]

EXHIBIT IV.—CONTINUED.—*Stating for each of 28 Diseases by Months, on what Per Years 1888-1890; also the Averages by Months*

What Per Cent of the Reports Received Stated Presence of the Disease.‡

Line Number.	January.*					February.*					March.*				
	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.
	Average Disease†	29	26	23	24	Average Disease†	29	26	22	26	Average Disease†	30	25	24	27
1	Influenza	53	92	42	43	Influenza	58	95	44	56	Bronchitis	75	76	69	74
2	Rheumatism	72	73	66	66	Bronchitis	75	74	68	76	Neuralgia	72	73	63	71
3	Bronchitis	74	71	65	63	Neuralgia	70	72	65	68	Influenza	57	73	48	53
4	Neuralgia	68	68	64	66	Rheumatism	72	69	63	73	Rheumatism	74	72	66	74
5	Pneumonia	55	58	41	42	Pneumonia	60	59	45	51	Tonsillitis	60	55	54	60
6	Tonsillitis	59	57	55	55	Tonsillitis	60	56	54	55	Consumption, Pul.	65	55	50	52
7	Consumption, Pul.	62	50	49	50	Consumption, Pul.	64	53	49	51	Pneumonia	58	44	44	54
8	Intermittent Fev.	54	33	36	40	Intermittent Fev.	55	33	33	41	Intermittent Fev.	58	33	34	45
9	Diarrhea	27	27	27	23	Diarrhea	28	28	25	26	Diarrhea	29	31	29	31
10	Pleuritis	24	25	23	24	Pleuritis	26	26	20	32	Pleuritis	28	29	27	29
11	Erysipelas	26	23	25	26	Erysipelas	27	23	22	28	Inflam. of Kidney	24	22	22	23
12	Remittent Fever	37	22	26	31	Inflam. of Kidney	23	22	18	20	Erysipelas	28	21	27	26
13	Inflam. of Kidney	23	17	19	22	Remittent Fever	36	19	22	35	Remittent Fever	38	20	24	32
14	Measles	10	12	5	16	Measles	13	19	4	25	Measles	16	19	4	28
15	Inflam. of Bowels	14	10	10	18	Inflam. of Bowels	13	13	10	13	Whooping-cough	19	12	19	11
16	Whooping-cough	18	10	14	9	Whooping-cough	19	13	15	11	Inflam. of Bowels	15	11	10	17
17	Diphtheria	24	9	9	9	Diphtheria	21	9	3	10	Scarlet Fever	21	9	9	9
18	Scarlet Feve.	21	8	19	15	Scarlet Fever	21	8	11	11	Diphtheria	18	6	6	7
19	Dysentery	7	6	8	6	Dysentery	6	7	4	6	Dysentery	8	6	5	8
20	Typhoid Fev.(ent.)	10	6	8	10	Inflam. of Brain	6	5	5	6	Cer -Spinal Men.	5	5	3	4
21	Puerperal Fever	5	5	6	5	Cer.-Spinal Men.	4	5	3	3	Inflam. of Brain	6	4	6	6
22	Inflam. of Brain	6	4	4	6	Puerperal Fever	5	5	4	5	Membran. Croup	8	4	4	6
23	Membran. Croup	11	4	5	7	Cholera Morbus	4	3	1	2	Puerperal Fever	7	3	5	8
24	Typho-mal. Fever	16	4	12	11	Membran. Croup	9	3	3	5	Typhoid Fev.(ent.)	6	2	3	6
25	Cer.-Spinal Men.	3	2	1	2	Typho-mal. Fever	14	2	9	10	Cholera Morbus	5	2	1	4
26	Cholera Infantum	2	1	2	1	Typhoid Fev.(ent.)	8	1	5	7	Typho-mal. Fever	13	2	10	8
27	Cholera Morbus	4	1	2	4	Small-pox	1.1	1	1	1	Cholera Infantum	2	1	1	2
28	Small-pox	1.5	0	2	0.6	Cholera Infantum	2	0.3	1	0.7	Small-pox	0.7	0.3	0	0.3
	Reports received§	365	425	448	358	Reports received§	336	348	348	430	Reports received§	355	346	343	375

Line Number.	April.*					May.*					June.*				
	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.
	Average Disease†	29	26	23	26	Average Disease†	27	25	23	24	Average Disease†	26	23	21	28
1	Rheumatism	74	79	71	70	Rheumatism	71	78	70	70	Rheumatism	68	70	69	69
2	Neuralgia	72	75	70	66	Neuralgia	67	70	65	62	Neuralgia	64	65	63	56
3	Bronchitis	70	74	68	68	Bronchitis	61	66	61	63	Bronchitis	52	56	50	55
4	Consumption, Pul.	66	61	50	47	Consumption, Pul.	63	57	46	58	Consumption, Pul.	61	52	47	56
5	Tonsillitis	53	53	52	50	Tonsillitis	46	55	46	41	Intermittent Fev.	73	43	44	44
6	Influenza	50	53	50	41	Influenza	37	44	34	32	Diarrhea	44	42	37	36
7	Intermittent Fev.	66	40	48	45	Intermittent Fev.	71	40	41	46	Tonsillitis	40	41	39	32
8	Pneumonia	51	40	38	44	Pneumonia	38	30	29	40	Influenza	27	30	22	24
9	Inflam. of Kidney	28	29	21	24	Diarrhea	36	29	33	30	Remittent Fever	44	26	25	30
10	Diarrhea	31	28	29	29	Remittent Fever	42	26	22	33	Erysipelas	24	25	22	27
11	Erysipelas	28	24	28	30	Inflam. of Kidney	23	25	22	22	Measles	21	22	11	30
12	Remittent Fever	41	23	30	31	Erysipelas	26	23	21	27	Inflam. of Kidney	22	21	26	20
13	Pleuritis	24	22	24	23	Measles	25	22	10	37	Inflam. of Bowels	15	15	11	13
14	Measles	21	21	7	35	Pleuritis	18	22	17	18	Pleuritis	14	14	14	14
15	Whooping-cough	17	13	21	11	Whooping-cough	18	15	19	11	Pneumonia	24	11	16	24
16	Inflam. of Bowels	12	13	8	15	Inflam. of Bowels	14	12	13	15	Dysentery	13	13	6	8
17	Scarlet Fever	19	8	12	14	Diphtheria	15	8	5	7	Cholera Morbus	17	11	8	15
18	Dysentery	8	6	6	6	Dysentery	9	8	7	7	Scarlet Fever	15	9	9	9
19	Inflam. of Brain	7	5	7	6	Scarlet Fever	17	8	13	11	Whooping-cough	18	9	15	9
20	Membran. Croup	7	5	3	7	Typho-mal. Fever	11	6	9	10	Cholera Infantum	10	7	4	9
21	Diphtheria	17	5	5	8	Puerperal Fever	5	6	5	5	Inflam. of Brain	6	5	5	5
22	Typho-mal. Fever	12	5	13	11	Inflam. of Brain	6	5	5	4	Diphtheria	13	5	4	5
23	Puerperal Fever	5	5	5	4	Cer-Spinal Men.	5	4	4	2	Typhoid Fev.(ent.)	5	5	5	5
24	Cer.-Spinal Men.	6	4	3	4	Cholera Morbus	8	4	5	6	Puerperal Fever	5	4	4	3
25	Cholera Morbus	6	3	4	4	Membran. Croup	5	4	2	5	Cer.-Spinal Men.	4	3	1	3
26	Typhoid Fev.(ent.)	5	2	3	5	Cholera Infantum	3	3	1	3	Membran. Croup	4	3	1	3
27	Cholera Infantum	2	1	1	2	Typhoid Fev.(ent.)	5	2	4	4	Typho-mal. Fever	11	3	8	11
28	Small-pox	1.3	0	0.3	0	Small-pox	1.8	0	0	0.2	Small-pox	1.5	0	0	0
	Reports received§	310	363	330	361	Reports received§	360	371	485	483	Reports received§	359	353	401	383

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* For 1890 the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 92, the names of observers and the number of reports received from each are stated in Exhibit V., pages 96, 97.

† The numbers in this line are an average, not for all diseases represented, but only for those reported present in the given month. ‡ See foot-note with this mark on page 98.

§ The numbers in this line state how many reports were received for the month in the given year.

Cent of the Reports Received the diseases were stated to be Present in each of the
for the Period of thirteen Years, 1877-1889.

What Per Cent of the Reports Received Stated Presence of the Disease.‡															
July.*					August.*					September.*					
Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Line Number.
Average Disease†	28	24	24	22	Average Disease†	31	27	27	25	Average Disease†	31	26	28	25	
Rheumatism	61	68	64	58	Diarrhea	85	82	85	78	Diarrhea	79	71	77	73	1
Diarrhea	72	68	68	60	Rheumatism	57	62	56	53	Rheumatism	61	71	60	61	2
Neuralgia	60	61	60	57	Neuralgia	58	61	55	58	Neuralgia	59	64	58	51	3
Bronchitis	43	50	49	41	Cholera Morbus	56	54	58	48	Bronchitis	48	54	51	49	4
Consumption, Pul.	59	45	47	51	Bronchitis	41	52	44	39	Consumption, Pul.	58	51	50	41	5
Intermittent Fev.	74	44	50	47	Consumption, Pul.	57	50	46	49	Intermittent Fev.	74	43	50	48	6
Tonsillitis	31	38	31	24	Intermittent Fev.	74	48	51	46	Tonsillitis	36	41	35	27	7
Cholera Morbus	45	37	32	33	Cholera Infantum	47	43	44	40	Influenza	27	41	21	19	8
Remittent Fever	46	30	30	28	Dysentery	54	41	55	51	Dysentery	47	40	51	43	9
Influenza	19	24	16	13	Tonsillitis	31	37	34	21	Cholera Morbus	38	34	40	34	10
Cholera Infantum	31	23	23	23	Remittent Fever	53	33	35	41	Remittent Fever	56	31	41	47	11
Dysentery	30	23	23	25	Influenza	19	25	16	12	Cholera Infantum	35	26	40	29	12
Erysipelas	20	21	18	19	Inflam. of Bowels	20	22	19	16	Erysipelas	17	19	17	17	13
Inflam. of Kidney	19	20	25	15	Inflam. of Kidney	18	17	17	16	Inflam. of Kidney	17	18	19	14	14
Measles	13	16	7	10	Erysipelas	19	16	20	20	Inflam. of Bowels	17	16	17	14	15
Inflam. of Bowels	18	15	17	17	Typhoid Fev. (ent.)	13	15	12	12	Typhoid Fev. (ent.)	20	15	19	18	16
Pleuritis	10	13	12	8	Typho-mal. Fever	24	14	22	16	Pleuritis	10	14	11	9	17
Pneumonia	15	13	11	13	Pleuritis	9	12	10	8	Pneumonia	16	14	13	15	18
Whooping-cough	21	12	18	8	Pneumonia	13	10	12	10	Typho-mal. Fever	38	12	31	26	19
Scarlet Fever	12	7	7	6	Whooping-cough	20	10	15	7	Scarlet Fever	11	7	4	6	20
Inflam. of Brain	6	6	3	5	Scarlet Fever	10	8	4	4	Diphtheria	14	7	7	7	21
Diphtheria	12	6	8	5	Diphtheria	13	6	4	6	Whooping-cough	20	6	18	9	22
Typhoid Fev. (ent.)	7	6	5	7	Inflam of Brain	7	5	5	5	Inflam. of Brain	6	3	5	6	23
Typho-mal. Fever	15	6	11	7	Measles	6	5	3	3	Cer.-Spinal Men.	4	3	4	2	24
Cer.-Spinal Men.	4	3	2	2	Cer.-Spinal Men.	4	2	5	2	Measles	5	3	3	3	25
Puerperal Fever	4	3	4	4	Membran. Croup	2	2	1	0.8	Membran. Croup	4	2	2	1	26
Membran. Croup	2	2	1	0.5	Puerperal Fever	5	1	4	3	Puerperal Fever	5	2	4	4	27
Small-pox	1.2	0	0	0	Small-pox	0.6	0	0	0	Small-pox	0.4	0	0	0	28
Reports received§	379	486	487	400	Reports received§	398	409	417	523	Reports received§	373	435	416	414	

October.*					November.*					December.*					
Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1889.	Line Number.
Average Disease†	30	25	26	23	Average Disease†	28	25	23	22	Average Disease†	28	27	22	23	
Rheumatism	67	68	65	70	Rheumatism	71	74	64	68	Bronchitis	69	79	62	65	1
Bronchitis	55	65	57	59	Bronchitis	65	73	64	59	Rheumatism	72	75	67	69	2
Neuralgia	63	65	60	62	Neuralgia	67	66	66	64	Neuralgia	69	71	69	62	3
Diarrhea	54	54	56	37	Influenza	39	56	30	31	Influenza	46	69	37	40	4
Consumption, Pul.	60	51	52	43	Tonsillitis	55	55	58	49	Tonsillitis	59	61	57	49	5
Tonsillitis	44	51	47	35	Consumption, Pul.	60	49	49	44	Consumption, Pul.	60	55	51	48	6
Influenza	32	49	33	28	Intermittent Fev.	63	44	42	43	Pneumonia	41	39	27	33	7
Intermittent Fev.	72	45	47	48	Remittent Fever	44	33	30	33	Intermittent Fev.	56	36	39	38	8
Remittent Fever	54	31	42	39	Diarrhea	35	31	31	31	Pleuritis	20	31	17	22	9
Erysipelas	21	21	18	22	Pneumonia	32	25	29	24	Remittent Fever	39	29	28	30	10
Pneumonia	21	19	23	17	Inflam. of Kidney	19	24	19	18	Diarrhea	28	27	27	25	11
Inflam. of Kidney	19	19	17	15	Erysipelas	23	19	22	23	Erysipelas	24	23	23	30	12
Dysentery	23	18	20	15	Scarlet Fever	16	16	10	9	Inflam. of Kidney	21	22	19	21	13
Typhoid Fev. (ent.)	22	16	25	16	Pleuritis	17	15	17	16	Inflam of Bowels	15	14	16	13	14
Pleuritis	14	14	13	15	Typhoid Fev. (ent.)	20	13	19	12	Scarlet Fever	16	12	9	13	15
Scarlet Fever	15	14	11	9	Diphtheria	25	11	8	5	Diphtheria	24	10	9	6	16
Typho-mal. Fever	40	12	33	31	Inflam. of Bowels	13	9	14	12	Membran. Croup	10	9	4	5	17
Inflam. of Bowels	14	11	17	12	Dysentery	11	9	11	9	Measles	7	7	9	3	18
Cholera Morbus	15	11	11	11	Typho-mal. Fever	14	7	15	24	Dysentery	7	7	6	4	19
Diphtheria	23	9	11	7	Cholera Morbus	6	6	2	7	Typhoid Fev. (ent.)	14	7	12	10	20
Cholera Infantum	12	8	7	7	Membran. Croup	9	6	3	3	Typho-mal. Fever	20	6	12	15	21
Inflam. of Brain	5	5	6	5	Whooping-cough	17	5	10	8	Puerperal Fever	5	5	5	3	22
Membran. Croup	6	5	4	4	Inflam. of Brain	5	4	5	7	Whooping-cough	17	5	12	12	23
Measles	4	4	4	4	Measles	6	4	6	2	Inflam. of Brain	5	5	6	5	24
Whooping-cough	17	3	15	8	Cer.-Spinal Men.	3	3	2	3	Cholera Morbus	5	5	2	4	25
Puerperal Fever	5	2	8	4	Cholera Infantum	4	3	2	2	Cholera Infantum	2	3	1	3	26
Cer.-Spinal Men.	4	2	2	3	Puerperal Fever	5	2	5	3	Cer.-Spinal Men.	3	3	2	2	27
Small-pox	0.4	0	0	0	Small-pox	0.7	0	0.2	0.5	Small-pox	0.7	0	1	1	28
Reports received§	391	501	512	500	Reports received§	362	408	414	405	Reports received§	373	464	399	415	

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*, †, ‡. These notes are on page 98.
§ For this foot-note see page 94.

EXHIBIT V.—*By Months and by Geographical Divisions of the State*; the names of 155 Observers, whose Weekly Reports of Diseases for 1890 are compiled in Tables 1, 2, 3 and 4, the Localities [a] for which they Report, and the number of Reports received from Each Observer.*

Divisions and localities represented and physicians who reported. (Health officers in Italics.)	Weekly Reports in 1890, Compiled in this Article.												
	Year 1890.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
All localities	4,939	425	348	346	363	371	383	486	409	435	501	408	464
Upper Peninsular Division	296	23	20	23	15	21	23	22	25	30	38	28	28
Iron Mountain, *S. J. Gereau, M. D.*	25	----	----	----	----	4	3	4	2	2	4	3	3
Ironwood, *J. K. Niven, M. D.*	47	5	4	3	3	3	2	5	4	4	5	4	5
Ishpeming, *G. G. Barnett, M. D.*	11	----	----	4	----	----	----	----	4	3	----	----	----
Lake Linden, *Geo. W. Orr, M. D.*	30	5	4	4	----	----	----	----	----	3	5	4	5
Lake Linden, *M. E. de Laval, M. D.*	17	----	----	----	----	3	4	----	----	2	5	3	----
Manistique, *Geo. C. Hafford, M. D.*	30	----	----	----	----	----	4	5	4	4	5	3	5
Negaunee, *M. R. Morse, M. D.*	45	4	4	4	5	4	3	----	3	4	5	4	5
Rockland, *W. A. Burnham, M. D.*	20	5	4	4	3	4	----	----	----	----	----	----	----
Rockland, *W. C. Gates, M. D.*	22	----	----	----	----	----	4	3	4	4	4	3	----
Sault Ste. Marie, *H. R. Floyd, M. D.*	16	4	4	4	4	----	----	----	----	----	----	----	----
Wakefield, *J. H. Eddy, M. D.*	33	----	----	----	----	3	3	5	4	4	5	4	5
Northwestern Division	173	19	18	16	14	16	16	12	12	11	17	14	13
Cadillac, *M. C. Heath, M. D.*	47	5	4	4	5	4	4	3	4	4	3	4	3
Frankfort, *I. Voorheis, M. D.*	16	5	4	4	3	----	----	----	----	----	----	----	----
Frankfort, *J. M. Longman, M. D.*	21	----	----	----	----	4	4	----	----	----	5	3	5
Manistee, *J. A. King, M. D.*	10	4	2	4	----	----	----	----	----	----	----	----	----
Manistee, *L. A. Pelletier, M. D.*	36	----	----	----	3	4	4	5	4	4	4	3	5
Sutton's Bay, *H. A. Sifton, M. D.*	43	5	3	4	3	4	4	4	4	3	5	4	----
Northern Division	52	5	4	4	5	4	6	4	2	5	5	3	5
Boyne City, *A. J. DeLacey, M. D.*	45	5	4	4	5	4	4	4	----	2	5	3	5
Charlevoix, *Frank W. Le Fevre, M. D.*	7	----	----	----	----	----	2	----	2	3	----	----	----
Northeastern Division	101	10	10	8	10	8	4	5	4	8	12	10	12
Harrisville, *D. W. Mitchell, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Long Rapids, *H. A. Stonex, M. D.*	22	5	4	4	5	4	----	----	----	----	----	----	----
Rogers City, Samuel Phelps, M. D.	15	----	2	----	----	----	----	----	----	2	4	3	4
Rogers City, *R. C. Hill, M. D.*	11	----	----	----	----	----	----	----	----	2	3	3	3
Western Division	450	50	38	39	32	30	35	48	35	34	34	34	41
Casnovia, *Chauncey E. Koon, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Cannonsburg, C. R. Crosby, M. D.	47	5	4	3	5	3	4	5	4	3	3	3	5
Cedar Springs, *C. S. Ford, M. D.*	45	5	4	4	5	4	3	3	----	4	5	4	4
Grand Rapids, A. Hazlewood, M. D.	51	5	3	4	4	4	4	5	4	4	5	4	5
Grand Haven, *A. Vander Veen, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Grand Haven, *J. B. McNett, M. D.*	29	----	----	----	----	----	4	5	4	4	4	4	4
Hart, *A. A. Dunton, Jr., M. D.*	38	5	3	4	5	4	4	5	4	4	----	----	----
Hesperia, *Wm. C. Wells, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Hesperia, *S. B. Rolison, M. D.*	34	----	----	----	----	4	4	5	3	4	5	4	5
Holland, *Henry Kremers, M. D.*	24	----	----	----	----	----	----	5	4	3	3	4	5
Lowell, A. M. Elsworth, M. D.	42	5	4	4	5	3	4	5	4	4	4	----	----
Ludington, *G. W. Crosby, M. D.*	23	5	4	4	3	----	----	----	----	----	----	3	4
Ludington, *F. W. Graham, M. D.*	34	----	----	----	----	4	4	5	4	4	5	4	4
Muskegon, *H. C. Brown, M. D.*	44	5	4	4	5	4	4	5	4	----	----	4	5
Northern Central Division	108	15	12	12	5	4	7	12	10	11	5	7	8
Big Rapids, *I. W. Badger, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Coleman, *A. V. Linton, M. D.*	18	----	----	----	----	----	3	4	2	3	----	3	3
Harrison, *E. E. Bracey, M. D.*	11	----	----	----	----	----	----	3	4	4	----	----	----
Moreley, C. V. High, M. D.	13	5	4	4	----	----	----	----	----	----	----	----	----
Roscommon, *J. H. Curnalia, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Bay and Eastern Division	618	51	40	42	48	55	58	77	65	58	46	39	39
Algonac, *W. K. Moore, M. D.*	43	5	3	4	3	4	3	5	4	4	----	4	4
Bad Axe, *James S. Henderson, M. D.*	31	----	----	----	----	4	4	5	3	4	3	4	4
Brown City, *J. A. Watson, M. D.*	26	4	4	3	4	3	2	4	2	----	----	----	----
Cass City, *J. M. Truscott, M. D.*	21	----	----	----	5	4	4	5	3	----	----	----	----
Carsonville, *Allen M. Kay, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Chesaning, *H. W. Marsh, M. D.*	39	5	4	4	5	4	4	5	4	4	----	----	----
Columbiaville, *C. A. Wisner, M. D.*	39	5	4	4	5	4	4	5	4	4	----	----	----
Croswell, *T. S. Kingston, M. D.*	52	5	4	4	5	4	4	5	4	4	5	3	5
Emmett, *A. J. Abbott, M. D.*	17	----	----	----	----	----	2	4	4	4	3	----	----
Grindstone City, *W. J. Herrington, M. D.*	41	3	3	4	3	4	4	4	4	3	5	4	----

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[a] In many cases the reports include sickness in the vicinity as well as the corporate limits of the places named.

* For counties in each division see Exhibit I., page 89.

EXHIBIT V.—Continued.

Divisions and localities represented and physicians who reported. (Health Officers in Italics.)	Weekly Reports in 1890.—Compiled in this Article.												
	Year, 1890.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Bay and Eastern Division.—*Continued.*													
Kawkawlin, *A. Getchel, M. D.*	8	----	----	----	----	----	----	----	3	3	----	2	----
Marine City, *J. C. Vollmer, M. D.*	15	----	----	----	----	----	----	3	3	2	4	3	----
Otter Lake, *G. F. Parks, M. D.*	30	5	4	3	5	3	----	----	2	4	4	----	----
Port Huron, *Fred. Lohrstorfer, M. D.*	31	----	----	----	----	2	4	5	4	3	4	4	5
Port Sanilac, *J. M. Loop, M. D.*	26	----	----	----	----	----	4	5	4	4	----	4	5
Saginaw (East), W. L. Dickinson, M. D.	50	5	3	4	5	4	4	5	4	4	5	4	3
Saginaw (West), *N. D. Lee, M. D.*	53	5	4	4	5	4	4	5.	4	4	5	4	5
Sand Beach, *Howard Carey, M. D.*	12	----	----	----	----	3	4	3	2	----	----	----	----
Thornville, *J. S. Caulkins, M. D.*	41	4	3	4	----	4	4	4	3	4	5	3	3
Vassar, *W. H. Smith, M. D.*	30	----	----	----	3	4	3	5	4	3	3	----	5
Central Division	976	71	68	63	73	74	74	112	87	92	101	78	83
Alma, *I. N. Brainard, M. D.*	47	----	3	4	5	4	4	5	4	4	5	4	5
Brighton, *A. E. Boylan, M. D.*	32	----	----	----	----	4	3	5	3	4	4	4	5
Carson City, *Joshua Tenant, M. D.*	44	----	4	4	3	4	2	5	4	4	5	4	5
Charlotte, *A. R. Stealy, M. D.*	49	5	3	4	5	4	3	4	4	3	5	4	5
Durand, *A. G. Cowles, M. D.*	52	5	4	4	5	4	4	4	4	4	5	4	5
Eagle, *H. N. Swaney, M. D.*	20	5	4	4	4	----	----	3	----	----	----	----	----
Fowler, *G. C. Havens, M. D.*	16	5	4	4	----	----	3	----	----	----	----	----	----
Fowler, *H. A. Stroud, M. D.*	24	----	----	----	----	4	----	----	2	4	5	4	5
Fowlerville, *A. S. Austin, M. D.*	12	5	4	3	----	----	----	----	----	----	----	----	----
Fowlerville, *Byron Defendorf, M. D.*	11	----	----	----	----	3	3	3	----	2	----	----	----
Hamburg, M. J. Gillan, M. D.	12	----	----	----	----	----	----	4	4	4	----	----	----
Hastings, A. P. Drake, M. D.	52	5	4	4	5	4	4	5	4	4	5	4	4
Hastings, *F. R. Timmerman, M. D.*	43	5	4	4	5	----	----	3	4	4	5	4	5
Hubbardston, *H. W. Brown, M. D.*	30	----	----	----	----	----	4	5	4	3	5	4	5
Howard City, *J. Totten, M. D.*	47	5	4	4	5	4	4	5	4	4	5	3	----
Howell, J. A. Wessinger, M. D.	52	5	4	4	5	4	3	5	4	4	5	4	5
Ithaca, *W. M. Weller, M. D.*	9	----	2	----	4	3	----	----	----	----	----	----	----
Lakeview, *A. H. Forsyth, M. D.*	38	4	4	4	5	4	4	5	4	4	----	----	----
Linden, *H. H. Chase, M. D.*	22	----	----	----	----	----	----	4	3	4	4	3	4
Lyons, *B. M. Hutchinson, M. D.*	52	5	4	4	5	4	4	5	3	4	5	4	5
Maple Rapids, *Charles E. Knapp, M. D.*	8	----	----	----	----	----	----	3	----	2	----	3	----
Palo, F. A. Hargrave, M. D.	41	3	4	2	5	3	3	3	4	4	4	2	4
Potterville, *L. E. Higby, M. D.*	51	5	4	4	5	4	4	5	4	4	5	4	3
Portland, *G. D. Allen, M. D.*	17	----	----	----	3	----	----	5	2	2	3	2	----
Saranac, *Charles Wunch, M. D.*	27	----	----	----	----	4	4	5	4	3	4	3	----
Sheridan, W. H. Budd, M. D.	41	4	4	2	4	4	4	4	3	3	4	----	5
Stanton, W. P. Gamber, M. D.	46	5	4	4	----	2	4	5	4	4	5	4	5
Stanton, *Allen L. Corey, M. D.*	14	----	----	----	----	----	2	3	2	----	3	4	----
St. Johns, *Henry Palmer, M. D.*	29	----	----	----	----	4	4	5	4	4	5	3	----
Vermontville, *P. L. Green, M. D.*	18	----	----	----	----	3	4	4	2	2	----	----	3
Westphalia, *F. W. Martin, M. D.*	20	----	----	----	----	----	----	----	3	4	5	3	5
Southwestern Division	523	47	38	37	34	37	37	52	46	41	55	41	58
Allegan, *Wm. E. Rowe, M. D.*	19	----	----	----	----	----	----	4	3	2	5	2	3
Berrien Springs, *W. F. Bullard, M. D.*	52	5	4	4	5	4	3	5	4	4	5	4	5
Benton Harbor, *F. M. Kerry, M. D.*	35	----	----	----	----	4	4	5	4	4	5	4	5
Buchanan, *M. M. Knight, M. D.*	32	----	----	----	----	4	4	4	3	3	5	4	5
Cassopolis, *D. G. Sharpe, M. D.*	13	5	4	4	----	----	----	----	----	----	----	----	----
Decatur, *G. W. Mahoney, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Dowagiac, *C. W. Morse, M. D.*	14	----	----	----	----	----	----	4	3	2	----	----	5
Hartford, *H. C. Maynard, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Lawton, *I. E. Hamilton, M. D.*	9	4	2	3	----	----	----	----	----	----	----	----	----
Lawton, *Charles B. Long, M. D.*	11	----	----	----	4	3	2	----	2	----	----	----	----
New Buffalo, *A. E. Mason, M. D.*	12	4	4	4	----	----	----	----	----	----	----	----	----
Niles, *O. P. Horn, M. D.*	52	5	4	4	5	4	4	5	3	4	5	4	5
Otsego, *M. Chase, M. D.*	52	5	4	4	5	3	4	5	4	4	5	4	5
Otsego, *L. E. Clark, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Saugatuck, *Henry M. Stimson, M. D.*	33	----	----	----	----	3	4	5	4	3	5	4	5
South Haven, *O. A. Dean, M. D.*	10	4	4	2	----	----	--	----	----	----	----	----	----
South Haven, *W. G. Triece, M. D.*	20	----	----	----	----	----	----	----	4	3	5	3	5
Southern Central Division	878	74	57	55	67	67	59	73	66	76	104	84	96
Albion, *A. G. Bruce, M. D.*	9	----	----	----	----	----	----	----	----	2	----	4	3
Adrian, *Fred. R. Seger, M. D.*	27	----	----	----	----	----	2	5	4	4	4	4	4
Burr Oak, *J. C. Rollman, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Burr Oak, *C. D. Parsons, M. D.*	48	5	4	3	5	2	2	5	4	4	5	4	5
Clayton, *E. J. C. Ellis, M. D.*	21	----	----	----	----	4	3	3	2	4	----	2	3
Clinton, *John E. White, M. D.*	17	----	----	----	----	4	----	----	----	3	5	----	5
Coldwater, *L. A. Warsubo, M. D.*	50	5	4	4	5	4	4	4	4	3	5	4	4
Concord, *W. N. Keeler, M. D.*	49	5	3	4	5	4	4	3	3	4	5	4	5

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* For counties in each division see Exhibit I., page 89.

EXHIBIT V.—CONTINUED.

Divisions and localities represented and physicians who reported. (Health Officers in Italics.)	Weekly Reports in 1890, Compiled in this Article.												
	Year, 1890.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Southern Central Division (*Continued.*)													
Deerfield, *Webster Bliss, M. D.*	32	----	----	----	----	2	4	5	4	4	5	4	4
Galesburg, *O. F. Burroughs, M. D.*	15	----	----	----	----	3	----	----	----	3	4	2	3
Homer, *Arthur D. Bungham, M. D.*	14	----	----	----	----	----	----	----	2	4	5	3	----
Jonesville, *H. M. Warren, M. D.*	51	5	4	4	5	3	3	5	4	4	5	4	5
Kalamazoo, *H. H. Schaberg, M. D.*	44	5	4	4	5	4	----	----	4	4	5	4	5
Kalamazoo, W. B. Southard, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5
Kalamazoo, *A. B. Cornell, M. D.*	20	----	----	----	----	3	3	4	2	2	4	2	----
Litchfield, *George Martin, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Mendon, H. C. Clapp, M. D.	44	5	4	4	----	3	3	4	3	4	5	4	5
Mendon, *Edwin Stewart, M. D.*	40	5	3	4	4	4	3	----	4	----	4	4	5
Morenci, *Samuel Stevenson, M. D.*	18	----	----	----	----	----	----	----	----	4	5	4	5
Richland, *J. M. Rankin, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Sturgis, *S. B. Follett, M. D.*	43	5	4	----	4	4	4	5	4	----	4	4	5
Tecumseh, *J. F. Jenkins, M. D.*	32	4	3	4	4	2	----	----	----	3	4	3	5
Union City, *E. Brumfield, M. D.*	51	5	4	4	5	3	4	5	3	4	5	4	5
Vicksburg, *C. H. McKain, M. D.*	41	5	4	4	5	2	4	5	3	----	5	4	----
Southeastern Division	764	60	48	47	60	55	64	69	57	69	84	70	81
Armada, *S. T. Beardslee, M. D.*	52	5	4	4	5	4	4	5	4	3	5	4	5
Armada, *C. H. Lincoln, M. D.*	49	5	4	4	5	4	4	5	----	4	5	4	5
Detroit, H. R. Hitchcock, *M. D.*	20	----	----	----	----	----	3	3	2	2	4	4	3
Farmington, *J. J. Moore, M. D.*	33	----	----	----	----	2	4	5	4	4	5	4	5
Highland Park, *Alexander Stewart, M. D.*	33	----	----	----	----	3	4	4	4	4	5	4	5
Holly, *L. E. Wickens, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Memphis, *D. H. Cole, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Monroe, *Charles T. Southworth, M. D.*	7	----	----	----	----	----	----	----	----	2	3	2	----
New Haven, *Alexander Gunn, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Northville, *J. M. Swift, M. D.*	44	5	4	4	5	4	4	----	----	4	5	4	5
Oxford, *Will L. Cole, M. D.*	11	----	----	----	----	----	----	----	4	3	4	----	----
Plymouth, *J. M. Collier, M. D.*	32	5	4	3	5	3	3	----	----	----	----	4	5
Pontiac, *M. W. Gray, M. D.*	34	5	4	4	5	4	4	3	----	----	----	----	5
Pontiac, *H. S. Chapman, M. D.*	11	----	----	----	----	----	----	----	4	4	----	3	----
Richmond, *C. L. Chandler, M. D.*	35	----	----	----	----	4	4	5	4	4	5	4	5
Rochester, *H. P. Ewell, M. D.*	49	5	4	4	5	----	4	5	4	4	5	4	5
Rochester, *Jesse E. Wilson, M. D.*	25	----	----	----	----	3	3	4	4	4	4	3	----
Romeo, *Wm. Greenshields, M. D.*	51	5	4	4	5	4	4	5	3	3	5	4	5
Romeo, *J. B. Fares, M. D.*	53	5	4	4	5	4	4	5	4	4	5	4	5
Wayne, *Herbert E. Foster, M. D.*	18	----	----	----	----	----	----	----	----	4	4	2	3
Wyandotte, E. P. Christian, M. D.	53	5	4	4	5	4	4	5	4	4	5	4	5

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* For counties in each division see Exhibit I., page 89.

[Foot-notes from page 99.]

† The numbers opposite the names of the diseases do not state what per cent of the whole number of observers for the year reported the disease present at some time during the year, but state (on an average for the twelve months of the year) by what per cent of the observers making reports for the several months, the disease was reported present in those months. The column for each year is thus a statement for an average month of that year. On the two following pages of this table, however, the columns for each month state what per cent of the observers for that month (the number of whom is stated at the foot of the column) reported the given disease in that month.

[Foot-notes from pages 93, 94, 95.]

‡ Consumption, remittent fever, and typho-malarial fever were not printed on the first blanks used in making weekly reports (beginning with the month of September, 1876); neuralgia and tonsillitis were not printed on any blanks used prior to October, 1878, and not on all used for several months after that date; inflammation of brain and inflammation of bowels were not printed on any blanks used prior to July, 1879, and not on all used for several months after that date; inflammation of kidney was not printed on any of the cards used prior to October, 1883, and not on all used for several months after that date; pleuritis was not printed on any cards used prior to 1888, hence it is probable that these diseases were not so fully reported at first as were the other diseases.

TABLE 1.—*Stating, for each of the Fourteen Years 1877-1890, and the average for 1877-1889, by what Per Cent of Observers each of 28 Diseases was reported present in those Years (also the Average Number of Observers per Month and the Total Observers for each Year).—Compiled from Weekly Reports of Health Officers of Cities and Villages and from Regular Correspondents of the State Board of Health.** *—Diseases arranged in order of Greatest Number of Observers reporting them present in 1890.—(Continued, for each Month of several of the above mentioned Years, on pages 100 and 101).*

Line Number.	Diseases.	Observers by whom the Several Diseases were Reported Present.—Average Per Cents (per month) of those making Reports.†														
		Av. 1877-'89.	1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.
	Av. for tabulated diseases reported present.	40	37	36	35	37	37	38	42	43	43	45	43	44	39	38
1	Rheumatism	83	87	82	82	82	85	83	83	83	85	84	85	85	81	78
2	Neuralgia‡	81	85	82	79	83	83	83	84	85	85	78	79	75	----	----
3	Bronchitis	74	81	75	74	69	71	70	74	79	80	74	77	75	75	71
4	Tonsillitis‡	69	75	71	64	68	70	72	73	73	72	65	67	68	----	----
5	Diarrhea	64	68	65	60	65	64	66	71	67	69	67	63	65	57	58
6	Influenza	52	67	49	46	46	48	47	53	56	55	48	54	57	57	54
7	Consumption, Pul.‡	69	62	59	57	60	64	68	72	71	74	78	76	78	76	----
8	Intermittent Fever	78	58	61	59	64	71	73	79	82	83	90	90	90	90	85
9	Pneumonia	54	50	47	49	46	48	44	48	59	61	60	62	60	58	56
10	Erysipelas	43	43	43	44	44	43	44	48	47	42	42	45	43	35	35
11	Remittent Fever	59	40	45	49	46	48	52	60	57	64	66	67	69	71	68
12	Inflam. of kidney‡	35	36	35	33	32	35	34	41	----	----	----	----	----	----	----
13	Pleuritis‡	33	35	33	32	----	----	----	----	----	----	----	----	----	----	----
14	Dysentery	32	31	33	30	33	30	28	33	35	31	34	30	31	30	34
15	Inflam. of bowels ‡	30	29	29	30	32	32	32	30	31	28	26	25	----	----	----
16	Cholera morbus	32	29	27	29	33	29	33	37	32	31	41	34	34	25	26
17	Measles	20	22	12	25	22	10	9	17	37	20	37	30	18	7	12
18	Cholera infantum	23	21	21	20	24	25	21	26	24	22	27	23	23	20	17
19	Scarlet Fever	27	18	18	17	15	20	22	29	32	32	32	26	36	33	33
20	Whooping-cough	27	17	25	16	24	28	21	29	23	26	24	42	31	28	28
21	Diphtheria	31	16	12	14	18	24	27	27	31	43	51	43	45	37	32
22	Typhoid Fever (ent.)	19	14	17	16	15	15	16	20	19	24	26	21	18	16	22
23	Typho-mal. Fever	32	14	26	25	26	27	27	32	32	39	43	37	32	35	37
24	Inflam. of brain‡	13	12	13	13	15	13	14	14	12	12	12	13	----	----	----
25	Membranous croup	13	11	7	10	10	12	10	14	14	15	19	13	16	14	14
26	Puerperal Fever	12	9	13	12	14	12	13	16	15	18	12	8	8	6	10
27	Cer.-Spinal Men.	9	8	7	7	7	8	12	12	11	12	16	6	5	6	6
28	Small-pox	2	0.2	0.5	.07	.01	0.5	0.4	0.2	1	5	4	1	1	1	5
	No. of Observers	135	155	139	142	155	169	163	142	140	159	116	112	110	97	115
	Av. No. of Observers per month	88	102	100	102	114	113	104	79	88	93	70	79	73	64	66

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* For 1890, the number of observers, reports, weeks in each month, etc., are stated in the first five columns of Exhibit III., page 92, the names of the observers and the number of the reports received from each are stated in Exhibit V., pages 96, 97, 98.

†, ‡ Foot-notes are on preceding page.

TABLE I.—CONTINUED.a—*Per Cent of Observers by whom the Several Diseases were*
Months, for the thirteen

Per Cent of Observers by whom the Diseases were Reported Present.‡

Line Number.	January.*					February.*					March.*				
	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.
	Average†	41	39	36	35	Average †	40	36	32	38	Average †	41	36	34	38
1	Influenza	66	99	59	60	Influenza	69	99	57	70	Influenza	69	96	61	68
2	Rheumatism	87	91	83	79	Bronchitis	86	88	80	90	Bronchitis	86	90	81	86
3	Pneumonia	76	86	66	67	Pneumonia	78	86	69	76	Neuralgia	87	88	82	88
4	Bronchitis	85	84	83	77	Neuralgia	83	85	83	83	Rheumatism	85	86	81	83
5	Neuralgia	84	84	82	79	Rheumatism	85	85	75	87	Tonsillitis	79	78	74	79
6	Tonsillitis	79	84	82	77	Tonsillitis	78	75	75	75	Pneumonia	78	64	65	78
7	Consumpt'n, Pul.	70	66	60	56	Consumption, Pul.	71	60	61	62	Consumption, Pul.	73	61	62	60
8	Diarrhea	46	55	52	41	Diarrhea	44	50	42	48	Diarrhea	48	53	47	50
9	Intermittent Fev.	70	52	58	54	Intermittent Fever	69	48	49	57	Pleuritis	43	50	42	43
10	Pleuritis	43	51	45	40	Erysipelas	45	45	36	54	Intermittent Fev.	73	46	47	61
11	Erysipelas	48	43	49	44	Pleuritis	44	42	37	51	Erysipelas	47	43	45	47
12	Remittent Fever	52	32	40	42	Inflam. of Kidney	39	35	34	43	Inflam. of Kidney	40	40	42	38
13	Inflam. of Kidney	36	31	30	34	Measles	21	29	9	33	Measles	26	31	8	44
14	Inflam. of Bowels	26	23	28	33	Inflam. of Bowels	26	27	26	28	Remittent Fever	52	30	35	46
15	Diphtheria	39	20	17	16	Remittent Fever	57	24	33	55	Inflam. of Bowels	29	24	22	30
16	Whooping-cough	27	19	23	14	Whooping-cough	25	22	24	17	Whooping-cough	26	19	25	16
17	Measles	18	18	11	31	Diphtheria	34	17	7	21	Scarlet Fever	35	17	15	15
18	Scarlet Fever	34	18	32	25	Scarlet Fever	33	14	19	17	Inflam. of Brain	15	14	15	14
19	Inflam. of Brain	13	14	10	15	Dysentery	12	13	11	13	Cerebro-spi. Men.	11	14	11	9
20	Dysentery	16	14	22	14	Inflam. of Brain	14	12	13	15	Diphtheria	32	12	11	16
21	Typh'd Fev. (ent.)	17	14	12	14	Cerebro-spi. Men.	9	11	8	8	Dysentery	16	11	11	14
22	Membran's Croup	23	13	13	13	Membran. Croup	18	10	10	11	Membran. Croup	16	9	10	15
23	Typho-mal. Fev.	27	13	23	20	Puerperal Fever	12	10	10	16	Puerperal Fever	15	9	11	17
24	Puerperal Fever	13	13	14	11	Cholera Morbus	10	9	4	7	Cholera Morbus	12	7	2	11
25	Cerebro-spi. Men.	7	9	5	5	Typho-mal. Fever	23	4	19	20	Cholera Infantum	5	3	2	4
26	Cholera Infantum	5	5	3	2	Typh'd Fev. (ent.)	14	3	7	15	Typh'd Fev. (ent.)	11	3	4	11
27	Cholera Morbus	10	5	8	8	Cholera Infantum	4	1	4	2	Typho-mal. Fever	21	3	18	13
28	Small-pox	2	0	2	1	Small-pox	2	1	1	1	Small-pox	1	1	0	1
	Observers §	84	88	92	91	Observers §	84	92	89	87	Observers §	83	90	89	98

Line Number.	April.*					May.*					June.*				
	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.	Diseases.	Av. '77-'89.	1890.	1889.	1888.
	Average†	40	40	34	38	Average †	40	37	38	34	Average †	38	35	33	37
1	Neuralgia	86	92	86	84	Rheumatism	86	92	87	85	Rheumatism	84	87	85	86
2	Bronchitis	82	90	81	79	Neuralgia	82	85	83	75	Neuralgia	80	82	80	82
3	Rheumatism	88	89	87	89	Bronchitis	77	82	83	74	Bronchitis	69	70	71	75
4	Tonsillitis	74	81	77	72	Tonsillitis	70	75	75	55	Diarrhea	65	69	64	49
5	Influenza	63	77	64	55	Consumption, Pul.	72	69	60	66	Tonsillitis	64	66	66	67
6	Consumpt'n, Pul.	72	75	58	57	Influenza	53	62	54	35	Consumption, Pul.	68	62	59	62
7	Pneumonia	73	72	55	68	Intermittent Fev.	82	60	63	59	Intermittent Fev.	83	59	63	62
8	Intermittent Fev.	77	62	50	57	Pneumonia	63	53	56	44	Erysipelas	43	48	44	48
9	Diarrhea	49	56	43	47	Diarrhea	55	52	63	55	Influenza	39	41	36	43
10	Inflam. of Kidney	38	51	33	38	Inflam. of Kidney	38	42	88	34	Measles	31	37	18	57
11	Erysipelas	49	48	51	50	Remittent Fever	57	41	41	47	Remittent Fever	58	36	35	50
12	Pleuritis	42	43	42	41	Erysipelas	48	40	48	45	Inflam. of Kidney	38	35	42	39
13	Measles	32	39	13	50	Pleuritis	30	36	34	26	Pneumonia	43	30	34	64
14	Remittent Fever	55	35	43	43	Measles	37	35	21	44	Dysentery	24	29	14	21
15	Inflam. of Bowels	25	29	19	28	Inflam. of Bowels	29	29	29	23	Inflam. of Bowels	29	28	22	31
16	Whooping-cough	25	27	31	19	Whooping-cough	28	25	29	17	Pleuritis	32	27	27	37
17	Scarlet Fever	32	20	17	25	Dysentery	18	18	23	15	Cholera Morbus	38	25	20	19
18	Membran. Croup	14	15	8	16	Scarlet Fever	29	16	23	13	Cholera Infantum	22	19	10	9
19	Dysetery	15	14	12	16	Diphtheria	26	16	12	10	Whooping-cough	27	19	24	22
20	Inflam. of Brain	16	13	17	13	Typho-mal. Fever	21	14	19	17	Scarlet Fever	25	18	17	22
21	Typho-mal. Fever	20	13	19	21	Puerperal Fever	12	14	17	8	Inflam. of Brain	13	14	12	10
22	Puerperal Fever	11	13	10	15	Inflam. of Brain	13	13	15	11	Diphtheria	24	12	10	14
23	Diphtheria	29	10	8	18	Cerebro-spi Men.	10	11	11	7	Puerperal Fever	12	10	10	14
24	Cerebro-spi. men.	12	9	5	9	Membran. Croup	11	10	7	6	Membran. Croup	7	9	3	14
25	Cholera Morbus	13	8	7	13	Cholera Infantum	9	9	5	19	Cerebro-spi. Men.	9	8	3	6
26	Typh'd Fev. (ent.)	10	5	3	9	Cholera Morbus	20	9	17	29	Typh'd Fev. (ent.)	10	8	10	8
27	Cholera Infantum	4	3	3	4	Typh'd Fev. (ent.)	9	5	6	7	Typho-mal. Fever	21	6	14	22
28	Small-pox	2	0	1	0	Small-pox	3	0	0	0	Small-pox	2	0	0	1
	Observers §	78	79	86	96	Observers §	85	102	102	102	Observers §	87	106	103	100

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* For 1890 the number of observers, reports, weeks in each month, etc., are stated in the first five col-
stated in Exhibit V., pages 96-98. † The numbers in this line are an average, not for all diseases repre-
98. § The numbers in this line state how many observers reported for the month in the given year. a For

Reported Present by Months in each of the years 1888-1890, and the Average by years, 1877-1889.

Per Cent of Observers by whom the Diseases were Reported Present.‡

July.*					August.*					September.*					
Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Line Number.
Average†	41	40	40	34	Average †	43	40	41	39	Average †	44	39	40	37	
Diarrhea	90	92	89	83	Diarrhea	96	95	96	92	Diarrhea	93	87	86	86	1
Neuralgia	78	82	81	78	Neuralgia	75	80	76	78	Neuralgia	76	83	82	64	2
Rheumatism	78	82	85	75	Cholera Morbus	77	77	83	75	Rheumatism	76	83	75	78	3
Bronchitis	59	72	70	54	Rheumatism	74	74	74	72	Bronchitis	62	72	65	66	4
Cholera Morbus	70	68	60	59	Bronchitis	57	68	66	63	Tonsillitis	58	67	54	50	5
Tonsillitis	53	68	59	43	Cholera Infantum	67	66	65	62	Dysentery	70	65	73	67	6
Intermittent Fev.	84	65	67	59	Dysentery	75	64	82	76	Consumption, Pul.	64	59	57	50	7
Consumpt'n, Pul.	66	55	57	57	Tonsillitis	54	63	66	44	Intermittent Fev.	84	58	65	62	8
Remittent Fever	62	48	53	41	Intermittent Fev.	85	63	69	62	Cholera Morbus	64	56	63	59	9
Cholera Infantum	49	45	49	42	Consumption, Pul.	65	57	57	59	Influenza	41	55	31	32	10
Erysipelas	40	43	40	33	Inflam. of Bowels	36	45	31	33	Cholera Infantum	57	49	59	52	11
Dysentery	52	42	50	49	Remittent Fever	67	44	52	62	Remittent Fever	69	43	53	56	12
Inflam. of Kidney	34	37	45	28	Influenza	32	38	31	24	Erysipelas	33	37	41	31	13
Influenza	30	35	31	22	Erysipelas	36	35	39	38	Inflam. of Bowels	31	33	31	28	14
Pneumonia	30	32	27	26	Inflam. of Kidney	31	30	30	32	Inflam. of Kidney	27	28	32	19	15
Inflam. of Bowels	35	31	36	38	Typh'd Fev. (ent.)	23	25	21	23	Typh'd Fev. (ent.)	30	26	29	28	16
Measles	22	30	14	18	Typho-mal. Fev.	39	23	37	27	Pneumonia	30	25	27	27	17
Pleuritis	23	25	30	16	Pleuritis	20	22	20	20	Typho-mal. Fever	54	24	45	42	18
Whooping-cough	30	23	32	13	Pneumonia	25	21	27	25	Pleuritis	22	24	25	18	19
Scarlet Fever	21	16	15	11	Whooping-cough	30	18	25	15	Diphtheria	28	14	15	16	20
Inflam. of Brain	13	14	12	11	Inflam. of Brain	16	13	14	16	Scarlet Fever	19	12	9	12	21
Diphtheria	23	14	6	8	Scarlet Fever	18	13	10	7	Whooping-cough	28	11	31	16	22
Typho-mal. Fever	26	14	21	13	Measles	12	12	7	9	Inflam. of Brain	13	8	14	11	23
Typh'd Fev. (ent.)	13	13	13	16	Diphtheria	25	10	9	15	Membran. Croup	8	7	5	4	24
Puerperal Fever	11	12	13	11	Cerebro-spi. Men.	9	6	11	7	Measles	8	7	7	8	25
Cerebro-spi. Men.	8	8	7	5	Membran. Croup	5	6	4	4	Cerebro-spi. Men.	9	6	6	6	26
Membran. Croup	4	6	5	2	Puerperal Fever	12	3	9	12	Puerperal Fever	11	4	9	10	27
Small-pox	2	0	0	0	Small-pox	1	0	0	0	Small-pox	1	0	0	0	28
Observers §	91	108	103	109	Observers §	93	115	109	110	Observers §	91	123	110	109	

October.*					November.*					December.*					
Diseases.	Av.'77-'89.	1890.	1889.	1888.	Diseases.	Av.'77-'80.	1890.	1889.	1888.	Diseases.	Av.'77-'89.	1890.	1889.	1888.	Line Number.
Average †	43	40	42	38	Average †	40	37	35	32	Average †	39	41	34	33	
Rheumatism	83	89	84	87	Rheumatism	84	92	84	82	Rheumatism	85	95	81	83	1
Neuralgia	81	88	82	83	Branchitis	78	87	78	72	Bronchitis	82	93	78	80	2
Bronchitis	79	84	75	74	Neuralgia	82	85	86	76	Neuralgia	84	87	84	78	3
Tonsillitis	69	82	76	64	Tonsillitis	76	80	77	76	Influenza	60	84	68	52	4
Diarrhea	77	82	83	63	Influenza	54	73	44	48	Tonsillitis	80	84	77	72	5
Influenza	46	69	55	44	Intermittent Fev.	77	58	61	57	Pneumonia	63	71	49	50	6
Consumpt'n, Pul.	69	65	63	51	Diarrhea	56	58	58	50	Consumption, Pul.	68	65	63	57	7
Intermittent Fev.	83	63	66	67	Consumption, Pul.	68	56	57	52	Intermittent Fev.	71	58	57	51	8
Remittent Fever	67	49	61	58	Remittent Fever	59	49	45	43	Diarrhea	46	57	43	42	9
Erysipelas	41	46	42	46	Pneumonia	53	45	47	43	Pleuritis	38	55	37	38	10
Pneumonia	39	40	50	39	Erysipelas	42	40	44	42	Erysipelas	43	48	37	50	11
Dysentery	45	39	46	36	Inflam. of Kidney	33	37	30	28	Remittent Fever	54	46	40	45	12
Inflam. of Kidney	35	35	35	30	Pleuritis	31	32	31	30	Inflam. of Kidney	35	38	32	32	13
Pleuritis	29	29	26	32	Diphtheria	38	22	16	10	Inflam. of Bowels	29	31	34	26	14
Cholera Morbus	31	27	29	27	Dysentery	23	21	24	19	Scarlet Fever	30	24	20	25	15
Typh'd Fev. (ent.)	34	27	36	29	Scarlet Fever	25	21	17	17	Membran. Croup	20	22	11	12	16
Inflam. of Bowels	30	26	35	31	Inflam. of Bowels	27	20	30	26	Diphtheria	38	22	17	12	17
Typho-mal. Fever	56	24	49	50	Typh'd Fev. (ent.)	29	19	35	19	Dysentery	15	20	16	9	18
Scarlet Fever	24	23	19	16	Cholera Morbus	14	16	7	14	Measles	14	17	16	4	19
Cholera Infantum	25	20	23	19	Membran. Croup	18	15	6	8	Cholera Morbus	12	15	7	10	20
Diphtheria	37	19	21	14	Typho-mal. Fever	42	15	22	33	Typh'd Fev. (ent.)	22	14	16	14	21
Membran. Croup	14	15	10	14	Inflam. of Brain	11	10	12	14	Inflam. of Brain	12	13	15	12	22
Inflam. of Brain	11	14	14	11	Whooping-cough	24	10	15	13	Typho-mal. Fever	32	13	19	25	23
Puerperal Fever	12	9	19	11	Cholera Infantum	10	8	6	8	Puerperal Fever	11	12	13	8	24
Measles	8	8	8	10	Puerperal Fever	12	7	15	9	Whooping-cough	24	10	16	18	25
Whooping-cough	25	7	24	17	Cerebro-spi. Men.	7	6	5	6	Cerebro-spi. Men.	7	9	4	5	26
Cerebro-spi. Men.	9	6	5	6	Measles	10	6	13	6	Cholera Infantum	5	8	3	6	27
Small-pox	1	0	0	0	Small-pox	1	0	1	2	Small-pox	2	0	1	2	28
Observers §	91	109	107	105	Observers §	89	113	109	105	Observers §	88	101	104	109	

umns of Exhibit III., page 92, the names of observers and the number of reports received from each are sented, but only for those reported present in the given month. ‡ See foot-note with this mark on page first part of Table 1, and full heading, see page 99.

TABLE 2.—WEEKLY REPORTS OF DISEASES IN MICHIGAN IN 1890.—*Exhibiting for the Year and for each Month of the Year Ending Saturday, January 3, 1891, a Summary relative to diseases in the State of Michigan; also for each Month a Summary relative to Diseases in each of 11 Geographical Divisions* of the State.—Indicating the prevalence as regards Time and Area. Compiled from 4,939 Weekly Reports by 155 Observers, Health Officers of Cities and Villages, Regular Correspondents of the State Board of Health, and other Physicians, Reporting the Diseases under their observation.*

Number of Observers, Reports, etc.	Diseases.	(Av. b) Per Cent of Observers reporting Presence of.	Average Per cent of Weeks Reported Present where Present. c	Per cent of Reports Stating Presence of. d	Average Order of Prevalence Where Present. e	Average Order of Prevalence where Present.													
						1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	Av. 1877-1889.
Year Ending January 3, 1891.† Average number of localities represented 188. Whole number of Observers during the year, 155. Average per month, 102. Total number of reports compiled, 4,939.* Average per month, 412.	Average for tabulated diseases reported present.	37	65	25	3.8	3.3	3.5	3.7	3.7	3.8	4.2	4.2	4.2	4.9	4.7	4.7	4.4	4.1	......
	Brain, Inflammation of	12	38	5	5.4	4.8	6.4	6.2	5.9	6.0	6.4	6.6	6.6	8.7	8.1	......	......	......	......
	Bowels, Inflammation of	29	47	14	4.4	4.1	4.6	5.0	5.0	5.1	5.8	6.1	6.0	7.4	7.0	......	......	......	......
	Bronchitis	81	80	65	2.6	2.7	2.7	3.0	3.0	3.1	3.2	3.2	3.3	3.9	3.7	3.6	3.3	2.3	3.2
	Cerebro-Spinal Meningitis	8	39	3	4.7	4.2	4.6	7.8	7.3	6.9	6.9	7.4	7.2	7.9	7.1	7.4	5.9	6.0	6.7
	Cholera Infantum	21	50	10	3.5	3.4	4.0	4.1	3.9	4.6	4.8	4.8	4.9	5.1	5.2	5.4	5.7	4.9	4.7
	Cholera Morbus	29	58	15	3.5	3.4	3.7	3.8	4.2	4.5	4.9	5.0	5.2	5.8	5.3	5.8	5.7	4.7	4.7
	Consumption, Pulmonary	62	84	52	3.5	3.5	3.6	3.7	3.9	4.0	4.3	4.5	4.6	5.6	5.7	5.6	5.2	5.1	4.6
	Croup, Membranous	11	35	4	4.6	4.3	5.1	6.8	6.2	6.1	7.1	7.1	7.0	8.2	7.4	6.6	7.1	6.1	6.5
	Diphtheria	16	48	8	4.2	4.3	4.8	4.4	4.2	4.7	5.1	5.4	4.8	5.6	5.7	5.4	5.4	5.3	5.0
	Diarrhea	68	65	44	2.9	2.8	3.0	3.0	3.2	3.3	3.3	3.7	3.8	3.9	4.2	4.4	4.2	3.8	3.6
	Dysentery	31	52	16	3.8	3.7	3.8	4.3	4.5	5.0	5.0	5.2	5.3	5.1	5.8	6.2	5.9	4.9	5.0
	Erysipelas	43	49	21	4.1	4.1	4.4	4.7	4.5	4.6	5.2	5.5	5.5	6.2	6.8	6.5	6.4	5.8	5.4
	Fever, Intermittent	58	69	41	2.9	2.6	2.6	2.8	2.6	2.4	2.5	2.3	2.0	2.4	2.3	2.2	2.1	2.2	2.4
	Fever, Remittent	40	66	27	3.2	3.3	3.1	3.4	3.3	3.2	3.3	3.3	3.3	3.5	3.3	3.3	3.1	3.1	3.3
	Fever, Typhoid (Enteric)	14	57	8	3.8	3.9	4.2	4.5	4.7	4.7	5.2	5.1	5.1	6.2	6.5	7.0	7.0	5.5	5.4
	Fever, Typho-malarial	14	47	7	3.6	3.9	3.6	4.1	4.2	4.4	4.6	4.8	4.9	5.3	5.5	5.8	5.4	4.7	4.7

For the	Whole number of localities sented per month, 98. age number of observers Average No. of Reports	Influenza	67	78	53	2.2	2.4	2.7	3.0	2.7	2.9	3.3	3.2	3.1	3.5	3.0	3.1	3.1	3.0	3.0
		Kidndy, Inflammation of	86	58	21	4.1	4.1	4.5	4.9	4.7	4.4	5.0	------	------	------	------	------	------	------	------
		Measles	22	57	12	3.0	3.5	3.2	3.6	5.0	6.4	5.2	3.7	4.9	4.4	4.8	4.7	5.3	5.0	4.6
		Neuralgia	85	79	67	2.7	2.6	2.7	2.8	2.8	2.8	3.3	3.3	3.6	4.3	4.5	4.5	------	------	------
		Pleuritis	35	54	19	4.2	4.0	4.4	------	------	------	------	------	------	------	------	------	------	------	------
		Pneumonia	50	57	30	3.9	3.7	4.0	4.3	4.0	4.4	4.5	4.7	4.4	5.4	5.1	5.2	4.8	4.0	4.5
		Puerperal Fever	9	87	4	4.5	3.4	4.6	5.7	5.9	6.3	6.9	7.3	6.2	8.2	7.8	7.2	6.3	6.1	6.3
		Rheumatism	87	82	71	2.9	2.8	3.0	3.2	3.2	3.2	3.6	3.7	3.8	4.6	4.6	4.6	4.2	4.0	3.7
		Scarlatina	18	54	10	4.2	3.9	4.6	5.0	4.5	5.0	5.2	5.2	4.9	6.7	6.5	5.5	5.4	4.8	5.2
		Small-pox	0.2	38	0.1	6.5	11.0	15.3	26.0	25.9	8.4	26.0	14.0	9.1	8.9	6.3	10.6	3.9	6.8	18.2
		Tonsillitis	75	66	50	3.4	3.8	3.4	3.4	3.4	3.5	3.7	3.9	3.9	4.5	4.4	4.5	------	------	------
		Whooping-cough	17	52	9	3.2	3.3	3.9	4.2	3.7	4.1	4.5	5.2	4.4	6.3	5.5	4.7	4.8	5.1	4.6

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* For counties in each Division see Exhibit I., page 89.

† For number of Observers, reports, weeks in each month, etc., see Exhibit III., page 92; for names of observers, and number of reports received from each, see Exhibit V., pages 96, 97, and 98.

a Not every one of the observers sent in a report for every week, so that the number of reports received does not equal the number of observers multiplied by the number of weeks.

b The numbers in this column (pages 102-3) state not what per cent of the whole number of observers for the year reported the disease present at some time during the year, but the average (for the twelve months) of the per cents (of observers making reports for the several months) by which the disease was reported present in those months. The column for the year is thus a statement for an average *month*. But on pages 104 and 105 the numbers in the "Per Cent of Observers" column are statements for the month, and not averages. This column indicates the Area of Prevalence except that in a few instances there were two or more observers in one city or village.

c This column states for the year or given month, what per cent the number of reports which stated a disease to be present is of the number of card-reports received, for the given time, from such of the observers as reported the diseases present. It is therefore an average not for all localities represented, but only for those at which the given disease was reported present. In the line "Average for Tabulated Diseases" it states what per cent the number of times *all* diseases were reported present is of the number of times they *might have been* so reported on the cards received, for the time specified, from the observers who during that time reported the diseases present (that is, if each of the observers had on every card he sent reported every disease present which he reported present at all). It will be seen that this is a more accurate average than would be obtained by dividing the sum of the column by the number of diseases reported present.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State or Division, as the case may be. It combines, and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence. Had every observer sent a report every week of the month or year, the numbers in this column would be (for the State) the product of the numbers in the same line in the two preceding columns.

e The disease having the greatest number of cases was to be marked 1 in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals (for the State) of the Order of Prevalence column, in Table 3 (a table giving statements for each locality, omitted in printing this Report, for want of room), by the number of men who reported the disease present. The column is, therefore, an average not for all the localiites represented but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate a large prevalence of the disease, and *vice versa*; but the greater the number of diseases reported present by each observer from week to week, the greater will be the "average" in this column.

TABLE 2.—CONTINUED.—*Diseases in the State, 1890.* (*For foot-notes and full tabular heads, see pages 102–103.*)

Month.†	Diseases.	Per ct. of Observers Reporting Pres. of, b	Av. Per ct. of Weeks Reported Present, where present, a, c	Per cent of Reports stating Pres. of, d	Av. order of Prevalence where Pres. e	Month.†	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, a, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Month.†	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, a, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Month.†	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, a, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Month.†	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, a, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e	Month.†	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, a, c	Per cent of Reports stating Pres. of, d	Av. Order of Prevalence where Pres. e
	Av. for Tab. Dis. Rep. Pres.	39	66	26	3.9		36	72	26	3.7		36	69	25	3.4		40	64	26	3.2		37	66	25	3.2		35	64	23	3.1
January.†	Brain, Inflammation of	14	33	4	6.4	February.†	12	44	5	5.3	March.†	14	30	4	5.6	April.†	13	36	5	5.8	May.†	13	42	5	5.5	June.†	14	38	5	4.2
	Bowels, Inflammation of	23	44	10	5.5		27	47	13	5.2		24	46	11	4.7		29	45	13	4.3		29	43	12	4.2		28	50	15	4.1
	Bronchitis	84	85	71	2.7		88	85	74	2.7		90	85	76	2.4		90	83	74	2.3		82	80	66	2.3		70	80	56	2.5
	Cerebro-spinal Meningitis	9	26	2	5.0		11	49	5	4.9		14	33	5	4.2		9	44	4	4.0		11	37	4	4.8		8	41	3	4.6
	Cholera Infantum	5	20	1	5.3		1	25	0.3	6.0		3	33	1	4.3		3	20	1	1.5		9	34	3	4.6		19	38	7	3.9
	Cholera Morbus	5	28	1	5.5		9	31	3	5.0		7	29	2	4.0		8	44	3	4.2		9	40	4	3.3		25	48	11	3.1
	Consumption, Pulmonary	66	76	50	4.2		60	89	53	3.9		61	90	55	3.6		75	81	61	3.1		69	82	57	3.0		62	84	52	2.9
	Croup, Membranous	13	29	4	5.6		10	31	3	5.8		9	52	4	4.1		15	34	5	3.5		10	36	4	5.8		9	32	3	3.8
	Diphtheria	20	43	9	5.1		17	51	9	4.5		12	48	6	4.5		10	47	5	3.6		16	50	8	4.5		12	49	5	5.0
	Diarrhea	55	50	27	4.4		50	56	28	4.0		53	58	31	3.5		56	51	28	3.6		52	56	29	3.5		69	59	42	2.9
	Dysentery	14	42	6	6.0		18	49	7	5.5		11	51	6	4.0		14	45	6	4.1		18	43	8	4.3		29	45	13	3.8
	Erysipelas	43	58	23	4.8		45	49	23	4.9		43	48	21	4.3		48	48	24	3.8		40	57	28	4.0		48	51	25	3.6
	Fever, Intermittent	52	63	33	3.7		48	70	33	3.8		46	74	33	3.2		62	63	40	3.1		60	68	40	2.6		59	73	43	2.7
	Fever, Remittent	32	67	22	4.1		24	76	19	3.7		30	69	20	3.4		35	62	23	3.0		41	63	26	3.4		36	72	26	2.7
	Fever, Typhoid (Enteric)	14	46	6	5.2		3	45	1	5.7		3	73	2	4.7		5	39	2	4.8		5	53	2	3.8		8	70	5	4.4
	Fever, Typho-malarial	13	33	4	5.1		4	50	2	5.8		3	58	2	2.7		13	37	5	3.2		14	47	6	3.2		6	42	3	3.5
	Influenza	99	93	92	1.2		99	96	95	1.2		96	76	73	2.1		77	68	53	2.5		62	71	44	2.4		41	72	30	2.8
	Kidney, Inflammation of	31	56	17	5.0		35	60	22	4.3		40	55	22	4.0		51	57	29	3.6		42	60	25	4.1		35	59	21	3.9
	Measles	18	68	12	4.4		29	65	19	3.2		31	64	19	2.5		39	52	21	2.8		35	63	22	2.7		37	68	22	2.9
	Neuralgia	84	81	68	3.0		85	85	72	3.1		88	83	73	2.8		92	80	75	2.3		85	82	70	2.4		82	80	65	2.5
	Pleuritis	51	49	25	4.8		42	61	26	4.7		50	58	29	4.3		43	53	22	4.1		36	61	22	3.9		27	52	14	3.9
	Pneumonia	86	67	58	4.1		86	69	59	3.9		64	68	44	3.8		72	55	40	3.7		53	55	30	3.4		30	47	14	3.9
	Puerperal Fever	13	38	5	5.3		10	51	5	5.1		9	30	3	5.5		13	44	5	3.4		14	40	6	3.8		10	41	4	5.4
	Rheumatism	91	81	73	3.6		85	81	69	3.5		86	84	72	3.0		89	89	79	2.6		92	84	78	2.5		87	81	70	2.5
	Scarlatina	18	44	8	5.6		14	59	8	5.5		17	54	9	5.3		20	43	8	4.4		16	49	8	3.9		18	50	9	3.6
	Small-pox	0	0	0	0		1	50	1	6.0		1	25	.08	7.0		0	0	0	0		0	0	0	0		0	0	0	0
	Tonsillitis	84	68	57	3.8		75	75	56	3.9		78	70	55	3.6		81	65	53	3.3		75	73	55	3.0		66	60	41	3.2
	Whooping-cough	19	53	10	4.4		22	57	18	3.6		19	62	12	3.4		27	48	13	3.4		25	53	15	3.4		19	51	9	3.3

	July.†				August.†				September.†				October.†				November.†				December.†			
Av. for Tab. Dis. Rep. Pres.	40	61	24	3.2	40	67	27	3.4	39	65	26	3.3	40	62	25	3.2	37	66	25	3.1	41	64	27	3.4
Brain, Inflammation of	14	42	6	5.1	13	33	5	5.9	8	36	3	6.1	14	38	5	5.1	10	46	4	4.5	13	38	5	5.2
Bowels, Inflammation of	31	50	15	4.0	45	48	22	4.4	33	51	16	4.0	26	45	11	4.1	20	48	9	4.4	31	45	14	4.7
Bronchitis	72	68	50	2.9	68	75	52	3.5	72	75	54	3.1	84	77	65	2.6	87	83	73	2.8	93	85	79	2.8
Cerebro-spinal Meningitis	8	40	3	4.2	6	35	2	5.0	6	42	3	6.1	6	46	2	4.5	6	56	3	3.7	9	28	3	5.7
Cholera Infantum	45	49	23	3.2	66	64	43	3.2	49	54	26	3.2	20	42	8	4.4	8	35	3	3.6	8	36	3	5.9
Cholera Morbus	68	54	37	3.2	77	69	54	3.1	56	59	34	3.5	27	42	11	4.1	16	35	6	3.4	15	29	5	4.5
Consumption, Pulmonary	55	82	45	3.8	57	86	50	3.7	59	85	51	3.7	65	81	51	3.4	56	87	49	3.5	65	84	55	3.6
Croup, Membranous	6	25	2	5.1	6	30	2	5.4	7	30	2	4.1	15	34	5	4.6	15	37	6	4.2	22	48	9	4.5
Diphtheria	14	41	6	3.6	10	52	6	4.8	14	52	7	4.0	19	48	9	3.8	22	50	11	4.1	22	46	10	4.1
Diarrhea	92	73	68	2.1	95	87	82	1.7	87	81	71	2.1	82	66	54	2.9	58	55	31	3.1	57	47	27	3.7
Dysentery	42	55	23	3.4	64	63	41	3.4	65	61	40	3.4	39	48	18	3.9	21	41	9	4.2	20	33	7	4.0
Erysipelas	43	47	21	3.8	35	46	16	4.2	37	53	19	4.0	46	46	21	3.8	40	49	19	3.9	48	48	23	4.5
Fever, Intermittent	65	68	44	2.7	63	74	48	2.7	58	73	48	2.9	63	71	45	2.6	58	75	44	2.9	58	61	36	3.2
Fever, Remittent	48	63	30	3.0	44	71	33	3.4	43	72	31	3.1	49	64	31	3.1	49	64	33	3.1	46	62	29	3.5
Fever, Typhoid (Enteric)	13	48	6	3.1	25	61	15	3.6	26	61	15	3.4	27	58	16	3.3	19	66	13	3.3	14	48	7	4.6
Fever, Typho-malarial	14	46	6	2 6	23	58	14	3.5	24	50	12	3.6	24	48	12	3.5	15	44	7	2.8	13	50	6	4.5
Influenza	35	64	24	3.4	38	66	25	3.1	55	73	41	2.7	69	72	49	2.3	73	75	56	2.1	84	82	69	1.9
Kidney, Inflammation of	37	55	20	3.9	30	56	17	4.6	28	64	18	4.6	35	55	19	4.2	37	63	24	3.6	38	56	22	4.2
Measles	30	53	16	2.9	12	46	5	4.3	7	35	3	3.2	8	47	4	3.3	6	59	4	1.7	17	48	7	2.8
Neuralgia	82	73	61	2.6	80	75	61	3.1	83	76	64	3.0	88	74	65	2.8	85	77	66	2.7	87	81	71	2.7
Pleuritis	25	49	13	4.1	22	54	12	4.5	24	56	14	4.5	29	48	14	4.2	32	45	15	3.7	55	56	31	4.0
Pneumonia	32	38	13	3.8	21	47	10	4.5	25	52	14	4.8	40	48	19	4.3	45	53	25	4.1	71	54	39	3.6
Puerperal Fever	12	28	3	4.1	8	36	1	3.3	4	40	2	4.2	9	24	2	4.2	7	32	2	4.9	12	45	5	4.6
Rheumatism	82	82	68	2.8	74	82	62	3.2	83	85	71	2.9	89	76	68	2.5	92	80	74	2.6	95	79	75	2.9
Scarlatina	16	45	7	4.8	13	54	8	3.9	12	60	7	4.0	23	61	14	3.1	21	75	16	3.4	24	51	12	4.1
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	68	55	38	3.3	63	57	37	3.6	67	60	41	3.8	82	63	51	3.2	80	68	55	3.1	84	72	61	3.1
Whooping-cough	23	50	12	2.8	18	57	10	2.6	11	58	6	2.2	7	45	3	3.8	10	48	5	3.4	10	46	5	3.6

TABLE 2.—CONTINUED. *Diseases in the Upper Peninsular, the Northwestern, the Northern, and the Northeastern Divisions of the State for the Years 1877-1889, and by Months in 1890,—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[1]

Division.*	Diseases.	1877-'89.‡	1890.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Upper Peninsular Division.*	Av. for Tab. Dis. Rep. Pres.	29	23	33	34	30	29	28	25	26	32	29	23	32	34
	Brain, Inflammation of	8	3	9	0	0	0	0	13	0	4	0	3	11	0
	Bowels, Inflammation of	19	13	0	10	17	20	10	0	9	32	23	5	18	11
	Bronchitis	75	61	65	75	87	87	57	35	36	44	53	53	68	86
	Cerebro-Spinal Meningitis	3	2	0	0	0	0	0	13	5	0	3	3	0	0
	Cholera Infantum	13	14	0	0	4	7	14	9	36	40	27	8	18	4
	Cholera Morbus	20	18	13	5	13	7	0	4	27	65	40	8	7	11
	Consumption, Pulmonary	68	87	17	60	61	73	43	43	23	48	30	32	32	11
	Croup, Membranous	6	5	0	0	4	7	10	4	5	0	3	3	11	14
	Diphtheria	10	9	13	0	13	13	24	17	9	4	3	3	11	4
	Diarrhea	62	66	57	60	70	53	29	48	95	96	97	71	61	43
	Dysentery	24	22	22	25	17	7	0	30	27	28	47	16	21	18
	Erysipelas	23	19	26	30	22	20	24	22	27	4	10	13	18	18
	Fever, Intermittent	9	2	0	0	0	0	10	17	5	0	0	0	0	0
	Fever, Remittent	13	3	4	15	4	13	0	0	5	4	0	0	0	0
	Fever, Typhoid (Enteric)	29	28	13	0	9	13	10	13	23	40	50	53	43	29
	Fever, Typho-malarial	4	2	0	0	0	0	14	0	0	8	3	3	0	0
	Influenza	41	41	91	75	65	40	33	4	18	4	23	37	39	71
	Kidney, Inflammation of	40	17	26	25	17	33	19	30	9	16	7	3	14	18
	Measles	17	13	0	5	13	27	24	35	27	8	7	5	4	11
	Neuralgia	57	61	61	45	65	53	48	61	59	68	63	55	64	82
	Pleuritis	----	20	48	15	26	13	10	9	9	12	17	16	21	39
	Pneumonia	37	33	35	30	26	53	43	17	18	16	20	26	48	75
	Puerperal Fever	6	5	4	0	9	13	14	4	14	0	0	5	0	4
	Rheumatism	64	60	52	40	70	53	62	61	68	64	57	58	68	64
	Scarlatina	24	10	0	0	9	13	29	22	5	0	3	21	21	0
	Small-pox	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	49	63	74	65	61	27	71	52	55	56	53	68	75	82
	Whooping-cough	22	8	4	5	13	0	0	0	0	0	0	0	0	14

Division.*	Diseases.	1877-'90.	1890.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northwestern Division.*	Av. for Tab. Dis. Rep. Pres.	31	25	41	33	35	29	28	31	35	44	43	30	34	37
	Brain, Inflammation of	5	6	0	8	6	0	0	13	8	17	9	6	7	0
	Bowels, Inflammation of	9	18	0	8	19	7	19	19	33	33	27	12	7	54
	Bronchitis	59	81	74	69	75	86	75	56	83	88	91	94	100	92
	Cerebro-Spinal Meningitis	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cholera Infantum	21	14	5	0	0	0	6	13	17	83	64	6	7	0
	Cholera Morbus	21	10	0	0	6	7	6	0	33	50	27	6	7	0
	Consumption, Pulmonary	44	61	74	69	56	36	63	63	75	67	82	41	57	62
	Croup, Membranous	7	5	0	0	0	14	6	6	8	8	0	0	0	23
	Diphtheria	14	6	11	0	0	7	6	0	8	0	0	12	0	31
	Diarrhea	55	43	37	15	44	36	63	44	75	75	64	41	29	0
	Dysentery	25	28	0	8	0	21	25	31	50	83	64	53	14	8
	Erysipelas	32	12	11	15	19	0	6	13	33	8	0	12	14	8
	Fever, Intermittent	70	15	26	15	25	0	13	0	0	25	36	18	14	8
	Fever, Remittent	40	12	0	0	0	7	19	0	0	0	36	35	29	23
	Fever, Typhoid (Enteric)	12	9	21	0	25	0	0	0	0	0	9	6	36	0
	Fever, Typho-malarial	26	5	0	0	0	21	19	0	0	0	9	12	0	0
	Influenza	44	36	79	85	31	14	13	25	17	0	9	18	43	85
	Kidney, Inflammation of	24	15	21	0	6	29	13	6	8	8	27	35	21	36
	Measles	13	20	0	15	6	36	50	63	83	33	0	0	0	8
	Neuralgia	69	64	58	69	81	50	69	63	50	58	91	71	50	54
	Pleuritis	----	33	42	15	63	64	44	13	0	33	45	24	21	28
	Pneumonia	41	39	79	62	56	36	31	19	33	83	18	24	29	38
	Puerperal Fever	5	3	0	23	0	7	6	0	8	0	0	0	0	0
	Rheumatism	69	60	42	38	44	64	63	68	67	67	73	65	79	62
	Scarlatina	19	10	16	15	18	14	6	6	0	0	0	12	21	8
	Small-pox	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	58	47	58	54	56	29	31	38	25	17	36	71	86	46
	Whooping-cough	17	8	0	8	0	0	0	0	42	0	0	0	0	0

Northern Division.*

Av. for Tab. Dis. Rep. Pres.	17	27	56	73	78‡	63	56	31	54	67	32	63	48	60
Brain, Inflammation of	5	46	20	75	50	100	75	17	0	0	20	80	33	60
Bowels, Inflammation of	6	8	20	25	0	0	0	17	25	0	0	0	0	0
Bronchitis	41	60	60	100	75	60	100	0	0	0	20	100	100	100
Cerebro-Spinal Meningitis	3	13	0	25	25	0	0	0	0	0	0	40	67	20
Cholera Infantium	7	0	0	0	0	0	0	0	0	0	0	0	0	0
Cholera Morbus	6	4	0	0	0	0	0	0	25	50	0	0	0	0
Consumption, Pulmonary	22	96	80	100	100	100	100	82	100	100	100	100	100	100
Croup, Membranous	1	8	0	0	0	40	0	17	0	0	0	0	0	20
Diphtheria	6	6	0	0	0	0	0	33	0	0	20	0	0	0
Diarrhea	29	2	0	0	0	0	0	0	0	50	0	0	0	0
Dysentery	18	4	0	0	0	0	0	0	25	50	0	0	0	0
Erysipelas	15	46	80	75	100	60	0	17	0	0	40	80	0	60
Fever, Intermittent	24	31	0	75	100	40	0	0	0	0	20	40	33	60
Fever, Remittent	6	12	0	0	0	40	0	0	0	0	0	0	33	60
Fever, Typhoid (Enteric)	9	6	0	0	0	0	0	0	0	100	20	0	0	0
Fever, Typho-malarial	9	4	0	0	0	0	0	0	0	0	20	0	0	20
Influenza	22	50	100	100	100	100	75	0	0	0	0	0	0	100
Kidney, Inflammation of	7	29	0	50	75	60	0	17	0	0	0	80	0	40
Measles	9	4	0	0	25	0	0	17	0	0	0	0	0	0
Neuralgia	46	50	80	100	100	20	25	0	50	0	40	60	33	80
Pleuritis	....	27	20	100	50	0	0	0	0	0	40	20	33	60
Pneumonia	17	23	20	25	50	60	25	0	0	0	20	20	33	20
Puerperal Fever	6	4	0	0	0	40	0	0	0	0	0	0	0	0
Rheumatism	53	75	80	100	100	100	25	67	100	50	40	100	33	80
Scarlatina	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Small-pox	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	29	35	60	75	75	0	25	0	0	0	20	40	33	80
Whooping-cough	10	0	0	0	0	0	0	0	0	0	0	0	0	0

Northeastern Division.*

Av. for Tab. Dis. Rep. Pres.	27	28	47	40	45	37	49	53	73	62	56	48	43	42
Brain, Inflammation of	3	1	0	0	0	0	0	25	0	0	0	0	0	0
Bowels, Inflammation of	18	23	0	10	13	20	38	100	100	25	38	17	0	8
Bronchitis	75	74	50	60	75	90	50	100	100	100	100	75	70	67
Cerebro-Spinal Meningitis	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Cholera Infantium	11	4	0	0	0	0	0	0	0	25	25	0	0	8
Cholera Morbus	12	5	0	0	0	0	0	0	0	25	50	0	0	0
Consumption, Pulmonary	53	40	50	0	0	50	50	100	40	0	25	25	70	67
Croup, Membranous	6	1	0	0	0	0	0	0	0	0	0	0	0	8
Diphtheria	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Diarrhea	62	34	10	20	13	10	25	50	100	100	75	33	30	25
Dysentery	24	5	0	0	25	10	0	0	0	25	0	0	10	0
Erysipelas	23	31	50	20	50	40	0	50	20	25	75	17	0	33
Fever, Intermittent	30	52	50	40	50	50	50	100	100	100	50	42	40	42
Fever, Remittent	16	0	0	0	0	0	0	0	0	0	0	0	0	0
Fever, Typhoid (Enteric)	3	2	0	0	0	0	25	0	0	0	0	0	0	0
Fever, Typho-malarial	8	1	0	0	0	0	0	0	0	0	0	0	10	0
Influenza	39	76	100	100	75	60	100	100	80	100	63	58	70	50
Kidney, Inflammation of	29	36	30	20	0	20	50	75	80	25	38	42	40	42
Measles	10	6	0	0	0	0	0	100	20	0	0	0	0	8
Neuralgia	76	70	50	40	63	60	50	100	100	100	75	75	80	92
Pleuritis	....	20	30	0	0	40	38	0	0	0	25	33	10	42
Pneumonia	31	27	40	50	38	40	38	0	0	0	13	0	20	42
Puerperal Fever	3	2	0	0	0	20	0	0	0	0	0	0	0	0
Rheumatism	71	68	50	40	50	50	75	100	100	100	100	67	70	75
Scarlatina	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	62	45	50	40	50	20	0	75	40	50	88	33	40	67
Whooping-cough	9	0	0	0	0	0	0	0	0	0	0	0	0	0

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*, †, d, See page 103. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 10 years' 1880-9; for neuralgia and tonsillitis, an average for the 11 years, 1879-89; pleuritis was not compiled until 1888; for other diseases and for the average line, an average for the 13 years 1877-89. For the Northern Division 1882-89. For the Northeastern Division 1883-89.

TABLE 2.—CONTINUED.—*Diseases in the Western, Northern Central, Bay and Eastern, and the Central Divisions of the State, for the Years 1877–1889, and by Months in 1890, indicating what per cent of the Weekly reports received Stated the Presence of the Disease Named.*a

Division.*	Diseases.	1877-'89.‡	1890.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Division.*	1877-'89.‡	1890.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Western Division.*	Av. for Tab. Dis. Rep. Pres.	30	27	28	81	83	28	25	29	28	39	82	80	35	30	Northern Central Division.*	26	21	50	54	34	62	52	43	20	28	28	58	46	48
	Brain, Inflammation of	5	2	0	0	3	0	7	0	2	3	0	0	0	5		3	1	7	0	0	0	0	0	0	0	0	0	0	0
	Bowels, Inflammation of	15	19	20	16	13	6	17	84	19	34	18	24	15	15		5	2	0	0	17	0	0	0	0	0	0	0	0	0
	Bronchitis	54	63	68	82	55	66	58	49	38	40	50	68	82	81		50	64	60	67	50	100	100	90	42	40	36	100	71	100
	Cerebro-spinal Meningitis	3	7	8	18	10	9	7	9	8	0	6	6	0	2		7	1	0	0	0	0	0	0	0	0	0	0	0	18
	Cholera Infantum	14	12	0	0	0	3	0	9	29	46	85	3	3	10		11	7	0	0	0	0	0	0	33	30	9	0	0	0
	Cholera Morbus	19	16	2	3	3	0	0	17	50	54	41	6	3	12		16	7	0	0	0	0	0	0	25	80	18	0	0	0
	Consumption, Pulmonary	47	50	38	29	41	41	43	54	50	63	47	59	74	61		33	81	33	8	8	0	50	43	0	20	36	100	57	88
	Croup, Membranous	6	6	12	3	0	3	3	6	6	3	0	9	6	17		8	2	0	0	0	0	0	0	0	0	9	20	0	0
	Diphtheria	23	15	10	18	18	3	7	14	10	34	15	15	29	12		23	3	0	0	0	0	0	0	0	0	0	0	29	13
	Diarrhea	47	43	24	29	26	28	27	51	79	89	62	53	24	27		44	23	13	0	8	40	0	43	67	40	18	40	14	0
	Dysentery	24	13	2	3	0	0	13	14	25	40	29	21	9	2		16	10	0	0	17	0	0	0	25	20	36	0	0	0
	Erysipelas	29	22	22	16	18	28	27	23	21	23	15	15	26	29		28	20	27	25	25	40	25	43	25	0	0	0	14	25
	Fever, Intermittent	71	48	30	26	21	47	47	54	58	60	68	68	65	44		65	54	93	83	50	20	75	43	50	40	36	60	57	0
	Fever, Remittent	57	38	24	21	21	13	30	40	44	57	38	53	71	49		50	48	33	33	33	100	100	43	50	40	45	80	57	50
	Fever, Typhoid (Enteric)	10	7	2	0	0	3	0	0	2	20	21	15	24	2		8	11	0	0	0	0	0	0	8	80	36	60	14	0
	Fever, Typho-malarial	24	4	10	8	0	0	10	9	0	0	6	6	8	2		26	4	0	0	0	0	0	0	8	0	18	20	0	0
	Influenza	45	58	88	95	82	41	37	46	40	43	53	68	47	49		9	89	80	67	83	20	0	43	0	10	27	0	57	75
	Kidney, Inflammation of	14	24	24	26	18	31	20	26	23	26	12	21	29	27		9	1	0	0	0	0	0	0	8	0	0	0	0	0
	Measles	6	10	8	13	21	19	17	0	5	8	6	6	9	15		14	27	60	67	83	0	0	29	25	0	0	0	14	25
	Neuralgia	72	75	58	71	79	75	73	66	67	80	82	76	94	90		54	57	80	75	67	100	25	43	38	20	36	100	71	50
	Pleuritis	----	26	22	26	38	44	27	29	19	17	21	12	26	41		----	5	0	0	0	0	0	14	8	20	0	0	0	13
	Pneumonia	36	35	64	68	64	44	20	11	10	14	21	18	32	44		31	34	87	75	50	60	25	29	0	0	0	40	0	13
	Puerperal Fever	7	6	6	13	8	6	18	3	2	0	8	9	0	12		5	3	0	0	0	0	25	0	0	0	0	0	0	25
	Rheumatism	63	78	78	74	67	72	63	69	60	71	74	74	85	85		58	66	60	67	42	100	100	86	42	80	64	80	100	100
	Scarlatina	20	12	8	0	3	8	3	17	19	20	15	12	24	17		9	19	83	50	83	20	25	0	0	0	16	20	0	18
	Small-pox	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0		0.6	3	0	17	8	0	0	0	0	0	0	0	0	0
	Tonsillitis	53	58	62	68	59	66	37	31	38	51	41	53	53	68		55	46	67	67	67	80	50	14	42	0	9	40	43	75
	Whooping-cough	15	3	2	3	0	3	10	6	6	0	0	3	3	2		14	5	13	0	0	0	25	0	8	0	0	0	0	13

Bay and Eastern Division.*

Av. for Tab. Dis. Rep. Pres.	32	30	36	34	31	29	29	25	27	34	33	34	30	42
Brain, Inflammation of	6	6	6	3	2	2	5	8	6	11	7	13	3	15
Bowels, Inflammation of	21	24	24	25	10	23	16	22	27	35	29	22	15	28
Bronchitis	68	72	78	75	76	71	75	66	60	66	62	78	79	92
Cerebro-spinal Meningitis	5	5	4	5	2	6	5	8	3	8	3	4	5	18
Cholera Infantum	17	17	0	0	0	0	4	7	30	52	48	26	3	3
Cholera Morbus	21	22	0	3	0	8	5	9	45	62	52	26	3	5
Consumption, Pulmonary	65	70	80	83	81	78	71	55	60	62	72	70	59	87
Croup, Membranous	9	7	8	8	7	8	4	5	1	3	7	13	10	21
Diphtheria	23	16	22	20	17	15	18	7	6	6	14	28	21	33
Diarrhea	49	47	16	38	31	23	31	36	62	88	78	65	41	31
Dysentery	19	13	0	3	2	0	2	5	19	40	38	17	8	8
Erysipelas	24	22	25	23	14	21	11	33	21	22	16	28	13	41
Fever, Intermittent	71	43	41	38	31	35	45	43	34	46	43	65	49	44
Fever, Remittent	43	22	27	15	21	19	33	17	22	31	24	17	10	23
Fever, Typhoid (Enteric)	9	16	12	8	5	8	4	17	14	25	26	33	15	·21
Fever, Typho-malarial	28	10	8	3	0	2	0	5	10	17	19	15	21	21
Influenza	41	51	100	98	81	58	40	24	19	22	40	57	59	72
Kidney, Inflammation of	21	27	16	35	29	25	20	28	16	26	33	28	44	41
Measles	14	19	16	18	29	25	36	33	29	17	7	4	0	0
Neuralgia	70	77	86	90	76	90	84	79	64	66	71	67	85	85
Pleuritis	----	30	33	38	36	25	36	22	27	22	24	22	23	59
Pneumonia	39	34	76	75	50	29	33	10	14	8	19	43	36	62
Puerperal Fever	5	7	16	3	2	13	18	12	8	0	2	2	8	0
Rheumatism	74	80	82	98	81	81	80	74	68	71	91	72	87	97
Scarlatina	16	14	4	15	12	10	16	14	9	14	14	24	21	28
Small-pox	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	50	50	65	65	43	42	45	41	36	38	43	72	56	74
Whooping-cough	23	12	14	13	10	8	20	14	16	18	12	7	5	0

Central Division.*

Av. for Tab. Dis. Rep. Pres.	26	24	28	30	28	29	24	25	25	24	24	25	25	28
Brain, Inflammation of	5	3	4	4	3	1	4	1	7	2	2	3	5	2
Bowels, Inflammation of	14	11	14	7	5	4	5	8	14	16	17	7	9	19
Bronchitis	53	57	55	66	70	64	59	53	45	41	49	57	64	76
Cerebro-spinal Meningitis	4	3	3	9	8	1	4	0	8	1	0	0	4	1
Cholera Infantum	10	8	3	0	3	0	3	7	17	25	21	4	0	0
Cholera Morbus	14	14	0	4	2	0	4	11	34	44	27	6	8	5
Consumption, Pulmonary	57	43	44	49	49	58	47	45	42	44	41	37	27	45
Croup, Membranous	3	5	3	4	8	7	5	5	1	1	1	6	8	12
Diphtheria	18	5	13	10	6	7	4	4	0	1	1	8	8	7
Diarrhea	42	45	30	26	25	21	24	46	72	78	78	54	32	29
Dysentery	14	16	6	4	6	0	7	12	26	37	42	22	4	6
Erysipelas	20	23	34	28	25	15	30	27	21	16	20	22	29	13
Fever, Intermittent	68	48	41	35	44	38	42	58	55	47	46	52	55	55
Fever, Remittent	45	35	30	26	32	38	35	36	38	37	36	39	36	36
Fever, Typhoid (Enteric)	11	2	0	0	0	0	1	1	0	2	3	4	6	2
Fever, Typho-malarial	18	4	1	1	0	4	4	0	2	11	10	9	4	1
Influenza	35	52	94	99	71	45	42	31	19	29	37	47	62	76
Kidney, Inflammation of	20	28	23	22	25	23	16	23	30	17	28	23	31	23
Measles	10	15	31	47	44	32	23	9	4	0	1	6	4	4
Neuralgia	64	68	72	81	76	78	69	68	61	61	59	70	63	78
Pleuritis	----	14	20	28	24	12	18	9	8	8	9	9	12	24
Pneumonia	31	26	48	62	29	41	32	18	11	9	7	15	19	40
Puerperal Fever	5	3	1	7	2	0	1	0	2	3	5	1	4	7
Rheumatism	61	64	70	63	60	68	72	66	62	46	59	62	73	71
Scarlatina	11	8	11	6	10	8	5	4	1	2	1	16	21	18
Small-pox	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	41	47	45	47	48	45	59	36	43	34	33	55	59	60
Whooping-cough	16	13	7	15	14	21	22	18	14	16	10	5	6	11

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*, †, d. See page 103. ‡ Inflammation of kidney was not compiled until 1884. For inflam. of brain and inflam. of bowels, an average for the 10 years, 1880-9; for neuralgia and tonsillitis, an av. for the 11 years, 1879-89; pleuritis was not compiled until 1888; for other diseases, and for the average line, an av. for the 13 years, 1877-89.

TABLE 2.—CONTINUED.—*Diseases in the Southwestern and Southern Central Divisions of the State, for the years 1877-89, and by Months in 1890.—Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	1877-89.‡	1890.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Southwestern Division.*	Av for Tab. Dis. Rep. Pres.	28	24	27	34	33	38	32	27	27	36	33	26	26	27
	Brain, Inflammation of	4	2	2	0	0	0	8	3	2	0	0	4	2	8
	Bowels, Inflammation of	11	10	2	18	16	15	14	22	8	18	5	4	7	5
	Bronchitis	52	64	62	63	59	82	76	68	52	57	49	64	71	71
	Cerebro-Spinal Meningitis	2	0.4	0	0	8	0	3	0	0	0	0	0	0	0
	Cholera Infantum	18	11	0	0	0	0	3	5	25	61	20	11	2	0
	Cholera Morbus	16	16	0	8	0	12	0	14	37	76	29	9	7	2
	Consumption, Pulmonary	68	62	31	55	59	79	65	54	50	59	68	71	78	74
	Croup, Membranous	4	2	0	0	0	0	0	0	0	0	0	5	7	5
	Diphtheria	11	3	0	0	0	0	0	0	12	7	0	5	0	8
	Diarrhea	38	35	15	16	32	12	19	27	56	87	61	44	17	17
	Dysentery	15	14	6	5	3	3	11	8	23	54	27	9	10	5
	Erysipelas	22	27	11	11	19	47	35	19	29	26	32	29	27	38
	Fever, Intermittent	73	42	26	45	43	65	41	43	48	48	46	47	29	31
	Fever, Remittent	47	26	23	11	0	8	14	16	37	39	41	35	41	33
	Fever, Typhoid (Enteric)	6	4	0	0	0	0	0	0	6	15	5	7	5	2
	Fever, Typho-Malarial	22	14	9	0	8	12	11	3	25	26	24	27	10	7
	Influenza	41	56	77	100	70	62	57	27	81	20	41	53	56	81
	Kidney, Inflammation of	13	15	4	8	16	32	38	16	17	20	10	18	15	5
	Measles	10	13	18	21	16	32	35	30	10	0	0	5	5	2
	Neuralgia	72	58	58	50	49	68	70	65	56	52	63	60	51	62
	Pleuritis		14	17	26	24	15	16	11	8	4	0	7	5	31
	Pneumonia	31	29	62	61	57	32	22	16	17	9	2	7	24	41
	Puerperal Fever	3	1	4	0	0	0	0	0	2	0	0	0	0	2
	Rheumatism	75	77	77	55	76	91	92	78	85	74	71	76	78	74
	Scarlatina	12	7	4	0	3	6	5	8	4	9	10	13	10	10
	Small-pox	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	37	49	49	50	59	74	65	49	38	28	41	38	54	62
	Whooping-cough	15	12	15	16	22	9	22	16	13	15	7	4	5	8

Div.*	Diseases.	1877-89.‡	1890.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Southern Central Division.*	Av for Tab. Dis. Rep. Pres.	29	26	28	31	29	29	27	26	28	30	29	25	24	26
	Brain, Inflammation of	4	6	8	11	5	8	9	5	11	8	3	4	5	6
	Bowels, Inflammation of	14	14	7	14	15	22	13	14	14	21	16	13	7	13
	Bronchitis	64	64	80	77	78	63	61	41	48	59	49	63	68	77
	Cerebro-Spinal Meningitis	3	4	1	5	4	12	4	7	8	8	5	3	4	0
	Cholera Infantum	11	10	1	2	2	0	1	12	23	45	21	9	4	6
	Cholera Morbus	18	16	1	4	2	3	10	25	34	47	37	18	12	5
	Consumption, Pulmonary	60	44	38	44	45	48	54	49	41	41	49	49	38	38
	Croup, Membranous	3	8	3	2	4	1	6	0	0	2	3	3	4	6
	Diphtheria	14	6	11	14	0	1	7	3	11	0	4	8	6	7
	Diarrhea	47	49	34	33	27	40	42	47	66	88	82	59	32	30
	Dysentery	18	20	7	9	7	15	9	19	32	50	54	22	11	6
	Erysipelas	18	16	5	16	11	18	21	22	19	13	16	21	17	14
	Fever, Intermittent	70	48	39	37	29	40	37	49	44	62	45	48	46	34
	Fever, Remittent	51	36	30	26	36	25	27	34	38	44	42	42	44	32
	Fever, Typhoid (Enteric)	9	6	7	0	0	0	3	8	5	11	7	9	8	6
	Fever, Typho-Malarial	18	6	1	0	4	4	9	0	4	15	12	8	4	7
	Influenza	88	61	95	95	73	67	61	41	30	83	49	56	65	69
	Kidney, Inflammation of	20	3	15	28	27	37	24	15	19	15	17	15	14	18
	Measles	10	7	1	4	2	12	12	15	11	6	3	5	5	8
	Neuralgia	70	77	81	88	87	84	82	80	79	74	75	62	74	74
	Pleuritis	----	17	30	25	20	24	18	8	12	5	13	9	14	27
	Pneumonia	35	30	55	51	38	34	30	15	11	9	24	24	21	33
	Puerperal Fever	3	2	0	0	0	3	0	7	3	2	0	1	3	5
	Rheumatism	73	76	78	79	85	84	88	76	85	70	74	65	64	70
	Scarlatina	15	10	8	5	13	6	1	5	11	9	8	16	19	9
	Small-pox	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	50	53	64	56	69	61	61	42	41	36	41	51	58	57
	Whooping-cough	17	14	24	32	25	27	22	7	15	6	7	6	10	5

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*, †, d. See page 103. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 10 years 1880-89; for neuralgia and tonsillitis, an average for the 11 years 1879-89; pleuritis was not compiled until 1888; for other diseases and for average line an average for the 13 years 1877-89.

TABLE 2.—CONTINUED.—*Diseases in the Southeastern Division of the State, for the Years 1877-89, and by Months in 1890, Indicating what Per Cent of the Weekly Reports Received Stated the Presence of the Diseases Named.*[d]

Div.*	Diseases.	1877-89.‡	1880.†	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Southeastern Division.*	Av. for Tab. Dis. Rep. Pres.	33	23	31	30	32	34	27	24	20	23	25	25	23	25
	Brain, Inflammation of	14	6	3	6	11	15	4	9	6	2	4	6	3	4
	Bowels, Inflammation of	20	8	8	10	6	8	9	3	3	12	6	11	7	7
	Bronchitis	68	73	93	88	94	88	69	70	59	42	61	65	77	79
	Cerebro-Spinal Meningitis	7	2	2	0	6	0	4	0	1	2	3	1	6	1
	Cholera Infantum	15	7	0	0	0	0	2	5	14	35	20	5	0	0
	Cholera Morbus	22	12	0	0	0	0	0	6	35	60	25	13	0	1
	Consumption, Pulmonary	78	59	75	71	72	75	64	53	39	47	49	56	49	63
	Croup, Membranous	12	3	3	6	9	5	0	0	1	4	1	2	3	0
	Diphtheria	28	6	0	2	0	0	5	2	3	4	16	7	17	7
	Diarrhea	51	42	28	27	32	35	24	39	61	72	64	52	26	31
	Dysentery	25	14	11	10	4	8	11	9	9	32	35	14	7	10
	Erysipelas	33	22	35	33	26	30	29	25	14	12	20	15	11	20
	Fever, Intermittent	64	40	17	21	32	47	53	42	42	51	45	38	50	33
	Fever, Remittent	41	20	10	15	17	22	24	28	20	18	26	23	20	20
	Fever, Typhoid (Enteric)	23	8	13	4	0	0	0	0	7	14	17	20	10	6
	Fever, Typho-Malarial	22	9	5	6	4	5	4	5	6	19	12	17	10	10
	Influenza	40	51	100	98	89	55	29	23	19	21	46	48	49	60
	Kidney, Inflammation of	28	20	17	17	23	27	40	20	16	7	14	14	23	21
	Measles	17	3	0	4	6	10	11	22	26	0	0	0	3	10
	Neuralgia	57	55	58	63	68	75	60	45	42	42	46	61	50	54
	Pleuritis	......	18	20	27	40	18	18	16	9	14	12	20	11	22
	Pneumonia	40	26	52	60	43	48	31	13	13	9	10	12	20	21
	Puerperal Fever	10	4	8	8	4	3	7	5	1	2	1	5	3	6
	Rheumatism	73	72	78	78	85	90	82	66	57	51	70	73	73	75
	Scarlatina	25	8	7	17	6	12	5	9	10	5	7	2	9	9
	Small-pox	3.4	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tonsillitis	48	46	53	54	47	62	64	45	30	42	45	37	40	46
	Whooping-cough	26	4	3	4	4	10	2	5	1	9	3	0	3	4

*, †, d. See page 103. ‡ Inflammation of kidney was not compiled until 1884. For inflammation of brain and inflammation of bowels, an average for the 10 years 1880-89; for neuralgia and tonsillitis an average for the 11 years 1879-89; pleuritis was not compiled until 1888; for other diseases and for average line an average for the 13 years 1877-89.

TABLE 4.—*A Summary for the Year 1890, relative to Diseases in each of the Eleven Divisions of the State,†—indicating the prevalence as regards both Time and Area.*

Diseases.	Upper Peninsular Div.*				Northwestern Div.*				Northern Div.*				Northeastern Div.*				Northern Central Div.*			
	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e	Per ct. of Observers Reporting Pres. of, b	Av. per ct. of Weeks Reported Present where Present, c	Per cent of Reports Stating Pres. of, d	Av. Order of Prevalence where Present, e
Average for Tabulated Diseases Reported Present	39	60	23	2.9	42	60	25	3.2	40	61	27	2.7	38	72	28	3.0	32	64	21	3.4
Brain, Inflammation of	11	33	3	3.6	20	29	6	3.7	71	59	46	3.1	4	25	1	4.0	4	30	1	6.0
Bowels, Inflammation of	37	38	13	4.2	41	44	18	2.8	29	24	8	3.0	42	53	23	3.6	4	50	2	3.0
Bronchitis	80	75	61	2.3	91	90	81	2.6	64	84	60	2.9	81	93	74	2.4	74	86	64	3.0
Cerebro-spinal Meningitis	7	30	2	4.0	0	0	0	0	36	33	13	3.6	0	0	0	0	14	20	1	5.0
Cholera Infantum	34	41	14	2.2	30	50	14	3.2	0	0	0	0	12	44	4	3.7	19	44	7	3.2
Cholera Morbus	37	46	18	2.9	25	44	10	2.7	14	33	4	2.0	15	42	5	3.5	22	36	7	3.0
Consumption, Pulmonary	49	79	37	3.1	77	80	61	3.6	100	96	96	1.9	46	80	40	4.0	52	58	31	4.6
Croup, Membranous	16	33	5	4.3	14	39	5	4.7	21	33	8	3.7	4	33	1	4.0	7	25	2	4.5
Diphtheria	22	48	9	4.1	16	42	6	3.6	14	60	6	3.0	0	0	0	0	7	33	3	4.0
Diarrhea	95	70	66	2.1	80	54	43	3.0	7	50	2	1.0	62	53	34	3.5	48	49	28	2.9
Dysentery	45	52	22	3.3	50	57	28	3.2	14	33	4	2.5	15	31	5	2.8	22	52	10	2.5
Erysipelas	42	44	19	3.3	30	38	12	3.8	57	71	46	3.6	54	54	31	4.0	48	39	20	4.8
Fever, Intermittent	5	50	2	4.3	25	59	15	4.3	50	55	31	3.1	46	100	52	2.9	63	79	54	2.7
Fever, Remittent	8	36	3	1.8	25	48	12	3.8	21	46	12	3.3	0	0	0	0	56	83	48	2.3
Fever, Typhoid (Enteric)	45	64	28	3.1	16	52	9	4.0	14	60	6	2.5	4	50	2	2.0	22	50	11	2.5
Fever, Typho-Malarial	7	37	2	2.8	16	32	5	3.3	14	25	4	3.0	4	33	1	2.0	11	33	4	3.0
Influenza	57	70	41	2.3	57	62	36	2.6	43	96	50	1.2	88	84	76	1.5	56	70	39	2.5
Kidney, Inflammation of	32	49	17	2.9	39	45	18	2.9	43	56	29	3.5	42	73	36	4.5	4	83	1	1.0
Measles	25	51	13	2.4	30	66	20	3.0	14	33	4	1.5	12	50	6	2.0	41	66	27	3.8
Neuralgia	84	72	61	2.8	91	70	64	2.7	71	63	50	2.4	81	85	70	1.8	67	79	57	2.9
Pleuritis	36	52	20	3.5	57	59	33	4.0	50	50	27	3.6	38	48	20	4.0	15	36	5	3.3
Pneumonia	58	56	33	3.7	75	52	39	3.8	64	32	23	3.2	46	55	27	3.8	56	57	34	4.1
Pueperal Fever	16	81	5	4.5	9	43	3	3.0	7	40	4	3.0	4	40	2	5.0	7	33	3	4.0
Rheumatism	89	67	60	2.9	84	70	60	2.6	93	80	75	1.7	77	88	68	2.1	70	91	66	3.4
Scarlatina	17	65	10	3.2	25	43	10	3.4	0	0	0	0	0	0	0	0	33	53	19	3.9
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	38	3	6.5
Tonsillitis	93	67	63	2.8	77	60	47	3.3	57	55	35	2.9	62	71	45	3.7	59	72	46	4.0
Whooping-cough	8	33	3	1.8	5	67	3	3.0	0	0	0	0	0	0	0	0	15	28	5	3.0

* For counties in each division see Exhibit I., page 89. b, c, d, e. See foot-notes with these marks in Table 2, page 108.
† This page includes the five Divisions of the State from which the fewest Weekly Reports were received.

TABLE 4.—CONTINUED.†

Diseases.	Western Division.*				Bay and Eastern Division.*				Central Division.*				Southwestern Div.*				S. Central Div.*				Southeastern Div.*			
	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Present. e	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Present. e	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Present. e	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Present. e	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Present. e	Per ct. of Observers Reporting Pres. of. b	Av. per ct. of Weeks Reported Present where Present. c	Per cent of Reports Stating Pres. of. d	Av. Order of Prevalence where Present. e
Average for Tabulated Diseases Reported Present	41	67	27	3.6	43	69	30	3.9	37	64	24	3.2	38	64	24	3.0	38	68	26	3.4	37	64	23	3.2
Brain, Inflammation of	6	27	2	5.0	18	36	6	6.7	10	35	8	4.1	6	26	2	3.8	14	44	6	7.3	15	38	6	5.4
Bowels, Inflammation of	36	53	19	4.9	45	52	24	5.2	25	42	11	4.1	29	35	10	3.8	23	60	14	5.1	20	41	8	4.2
Bronchitis	78	81	63	3.5	84	85	72	2.8	77	74	57	2.8	79	80	64	2.7	81	78	64	2.5	89	81	73	2.1
Cerebro-spinal Meningitis	14	52	7	4.0	15	35	5	5.3	6	40	3	5.0	2	29	0.4	3.5	11	40	4	4.8	7	32	2	4.9
Cholera Infantum	21	54	12	3.4	27	66	17	3.9	18	44	8	3.8	24	50	11	2.8	22	50	10	4.4	16	44	7	3.4
Cholera Morbus	28	60	16	4.1	35	62	22	4.4	28	50	14	3.4	33	48	16	3.3	30	55	16	3.4	23	54	12	2.9
Consumption, Pulmonary	59	82	50	4.1	75	93	70	3.4	54	80	43	3.7	72	84	62	3.5	58	78	44	3.6	64	90	59	2.9
Croup, Membranous	17	84	6	4.8	17	89	7	5.8	13	38	5	4.4	5	31	2	3.5	8	32	3	4.4	8	32	3	4.1
Diphtheria	35	45	15	4.4	25	59	16	4.9	10	51	5	4.0	7	34	3	3.2	15	41	6	5.1	11	52	6	2.5
Diarrhea	69	63	43	3.4	72	65	47	3.3	67	67	45	2.8	59	59	35	2.7	70	70	49	2.9	67	62	42	2.7
Dysentery	26	50	13	3.8	27	50	13	4.6	30	53	16	3.4	31	47	14	3.2	34	60	20	4.3	30	47	14	4.1
Erysipelas	39	57	22	4.4	44	48	22	5.0	46	49	23	3.9	50	52	27	3.9	32	49	16	4.2	46	48	22	4.0
Fever, Intermittent	69	70	48	2.9	58	78	43	3.2	67	71	48	2.9	64	66	42	3.0	60	70	43	2.9	63	62	40	2.7
Fever, Remittent	55	69	38	3.8	33	68	22	3.5	49	71	35	2.9	42	64	26	2.8	51	68	36	3.4	36	56	20	3.4
Fever, Typhoid (Enteric)	18	53	7	3.6	27	57	16	4.9	5	38	2	3.6	9	48	4	3.4	10	63	6	4.5	13	62	8	2.8
Fever, Typho-malarial	12	36	4	3.7	17	57	10	4.1	10	41	4	3.6	24	59	14	2.5	13	44	6	5.2	18	49	9	2.8
Influenza	65	90	58	2.2	61	83	51	2.5	70	73	52	2.2	74	75	56	2.0	76	78	61	2.2	63	80	51	2.0
Kidney, Inflammation of	36	66	24	4.4	47	58	27	4.9	37	64	28	3.8	30	51	15	3.1	32	61	2	4.8	39	50	20	4.3
Measles	18	55	10	2.2	30	62	19	4.1	26	58	15	2.5	22	59	13	2.8	14	52	7	3.4	15	51	8	2.8
Neuralgia	89	85	75	2.9	89	85	77	2.9	85	79	68	2.9	82	71	58	2.8	93	82	77	2.4	73	75	55	2.9
Pleuritis	48	54	26	4.3	48	62	30	5.2	28	50	14	3.9	28	47	14	4.4	29	57	17	4.1	37	49	18	4.0
Pneumonia	56	61	35	3.9	53	62	34	4.8	45	53	26	3.8	48	58	29	3.5	48	57	30	4.0	43	57	26	3.7
Puerperal Fever	15	41	6	5.6	17	37	7	4.9	7	37	3	4.1	2	36	1	3.7	4	50	2	3.4	13	33	4	4.4
Rheumatism	79	83	78	3.2	91	88	80	3.1	78	81	64	2.9	95	80	77	2.8	90	84	76	2.7	89	81	72	2.8
Scarlatina	22	51	12	4.1	20	68	14	5.1	17	49	8	3.8	15	47	7	2.5	18	54	10	4.7	15	53	8	5.1
Small-pox	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsillitis	79	66	53	3.8	73	68	50	4.2	71	65	47	3.3	80	60	49	3.1	76	70	53	3.0	72	64	46	3.4
Whooping-cough	8	38	3	4.4	22	58	12	3.1	24	51	13	2.5	22	50	12	3.1	23	61	14	3.8	9	44	4	3.8

* For counties in each division see Exhibit I., page 89. b, c, d, e. See foot-notes with these marks in Table 2, page 108.

† This page includes the six Divisions of the State from which the most Weekly Reports were received.

WHAT DISEASES CAUSE MOST SICKNESS.

This is shown in Exhibit VI., in this Report, and in similar exhibits in previous Reports. The question is differently answered in different years. For many years after the compilation of weekly reports was begun, intermittent fever appeared to be the leading cause of sickness in Michigan. In 1884 neuralgia headed the list, with rheumatism second and intermittent fever third. In 1885 neuralgia again headed the list, intermittent fever second, rheumatism third. In 1886 rheumatism headed the list, neuralgia second, bronchitis third, and intermittent fever fourth. In 1887 rheumatism, neuralgia, bronchitis, and consumption of the lungs, in the order named, headed the list. In 1888 rheumatism, neuralgia, bronchitis and intermittent fever, in the order named, headed the list. In 1889 rheumatism, neuralgia, bronchitis and diarrhea, in order named, headed the list. In 1890 rheumatism, neuralgia, bronchitis and influenza, in order named, caused most sickness in Michigan.

Nearly the same diseases appear above the average line each year. Pneumonia has appeared in this exhibit tenth in order for eleven years in succession. Some of the diseases of minor importance vary considerably in their order. Whooping-cough, for example, in 1881 and 1883 was nineteenth in order, and rose to twelfth in order in 1886, and dropped to nineteenth in 1887, and to twentieth in 1888, and rose to eleventh place in 1889, and dropped to thirteenth place in 1890.

Exhibit VII. supplies data relative to what diseases caused most sickness in 1890 in each of several geographical divisions of Michigan. It may be seen that there is evidence that there are very great differences in the different parts of the State. Further evidence is very desirable, however, in order to reach conclusions on this important subject. The exhibit will be found of great interest to those who study it carefully, and in connection with previous reports.

COMMENTS ON EXHIBIT XIII., PAGE 126, AND DIAGRAM 2, PAGE 125.

The lines for 1890 in Exhibit XIII., page 126, are graphically represented in Diagrams 1, page 91, 2, page 125, and 4 on page 133.

In Diagram 2, page 125, it may be seen that Influenza was very remarkably prevalent in the early months of 1890, and unusually so in the later months of the year. How greatly it differed in prevalence in 1890 from the preceding year may be seen by comparing Diagram 2 in this report with a similar diagram for the year 1889 in the Report of this Board for the year 1890, page 133.

EXHIBIT VI.—*Diseases from which there seems to have been the Most Sickness in Michigan in 1890, as indicated by the Per Cent of Weekly Reports Stating Presence of the Diseases, as studied in connection with the Average Order of Prevalence of said Diseases when Reported Present; also Order, Per Cent of Reports, and Average Order for the same Diseases in 1889, 1888, 1887 and 1886.*

	1890.				1889.			1888.			1887.†			1886.†		
	Order.*	Diseases in Order of Apparent Amount of Sickness in 1890, Most Prevalent Disease First.	Per Cent of Reports Stating Pres'ce of.d	Av. Order of Prevalence when Present.e	Order.*	Per Cent of Reports Stating Pres'ce of.d	Av. Order of Prevalence when Present.e	Order.*	Per Cent of Reports Stating Pres'ce of.d	Av. Order of Prevalence when Present.e	Order.*	Per Cent of Reports Stating Pres'ce of.d	Av. Order of Prevalence when Present.e	Order.*	Per Cent of Reports Stating Pres'ce of.d	Av. Order of Prevalence when Present.e
More Sickness than Average for 28 Diseases in 1890.	1	Rheumatism	71	2.9	1	65	2.8	1	66	3.0	1	69	3.2	1	70	3.2
	2	Neuralgia	67	2.7	2	63	2.6	2	62	2.7	2	67	2.8	2	67	2.8
	3	Bronchitis	65	2.6	3	58	2.7	3	59	2.7	3	55	3.0	3	56	3.0
	4	Influenza	53	2.2	8	32	2.4	8	32	2.7	8	33	3.0	8	35	2.7
	5	Diarrhea	44	2.9	4	45	2.8	6	41	3.0	6	48	3.0	7	45	3.2
	6	Consumption, Pulmonary	52	3.5	6	48	3.5	5	49	3.6	4	51	3.7	5	55	3.9
	7	Tonsillitis	50	3.4	7	46	3.3	7	41	3.4	7	47	3.4	6	49	3.4
	8	Intermittent Fever	41	2.9	5	43	2.6	4	45	2.6	5	48	2.8	4	54	2.6
	(9)	Av. for 28 diseases	25	3.3	(10)	23	3.3	(11)	24	3.5	(11)	25	3.7	(10)	26	3.7
Less than said Average.	9	Remittent Fever	27	3.2	9	30	3.2	9	34	3.1	9	32	3.4	9	34	3.3
	10	Pneumonia	30	3.9	10	26	3.7	10	30	4.0	10	28	4.3	10	27	4.0
	11	Measles	12	3.0	23	6	3.5	13	16	3.2	17	14	3.6	23	6	5.0
	12	Cholera Morbus	15	3.5	15	14	3.4	15	15	3.7	12	19	3.8	14	17	4.2
	13	Whooping-cough	9	3.2	11	16	3.3	20	9	3.9	19	14	4.2	12	20	3.7
	14	Dysentery	16	3.8	13	17	3.7	13	17	3.8	13	19	4.3	15	17	4.5
	15	Erysipelas	21	4.1	12	22	4.1	11	24	4.4	11	24	4.7	11	23	4.5

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* Judging from the per cent of reports which stated presence of the diseases in connection with the order of prevalence when present. The method of rating diseases, as causes of sickness, as shown in Exhibits VI. and VII., is fully described and illustrated by a "Compiling table" on pages 122 and 123 of the Annual Report for the year 1890.

† For 1886 and 1887 the average is for 27 diseases.

d This column states what per cent the number of reports stating presence of a disease is of the whole number of reports received for the time specified, from *all observers* in the State. It combines and states in a general way, an idea of the *time* a disease was prevalent, with an idea of the area of its prevalence.

e The disease having the greatest number of cases was to be marked 1, in the order; the disease having the next greatest number of cases, 2; and so on. Diseases not present were to be marked 0. The numbers in this column are found by dividing the totals of the Order of Prevalence columns, in Table 3 (omitted in this report), by the number of men who reported the disease present. The column is, therefore, an average, not for all the localities represented, but only for those at which the given disease was reported present. The numbers in the "Average" lines for this column are found by dividing the sum of the totals in the Order of Prevalence columns, in Table 3, for all diseases reported present, by the sum of the numbers of men who reported the different diseases present, thus counting each man once for every disease he reported present. As a rule, small numbers in this column indicate the large prevalence of the disease, and *vice versa;* but the greater the number of diseases reported present by each observer, from week to week, the greater will be the average in this column.

EXHIBIT VII.—*In each of Eleven Geographical Divisions* of the State, the Fifteen Diseases from which there seems to have been the Greatest Amount of Sickness in 1890, as indicated by the Per Cent of Weekly Reports Stating Presence of each of 28 Leading Diseases, when studied in connection with the Average Order of Prevalence of said diseases when reported present.*

	Order.†	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence when Pres. e	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence when Pres. e	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of.d	Av. Order of Prevalence when Pres. e
		UPPER PENINSULA DIV.*			NORTHWESTERN DIV.*			NORTHERN DIVISION.*		
More Sickness than Average for 28 Diseases.	1	Diarrhea	66	2.1	Bronchitis	81	2.6	Consumption, Pul.	96	1.9
	2	Bronchitis	61	2.3	Neuralgia	64	2.7	Rheumatism	75	1.7
	3	Tonsilitis	63	2.8	Rheumatism	60	2.6	Influenza	50	1.2
	4	Neuralgia	61	2.8	Influenza	36	2.6	Diarrhea	2	1.0
	5	Rheumatism	60	2.9	Diarrhea	43	3.0	Neuralgia	50	2.4
	6	Influenza	41	2.3	Consumption, Pul.	61	3.6	Bronchitis	60	2.9
	7	Consumption, Pul.	37	3.1	Tonsillitis	47	3.3	Measles	4	1.5
	8	Cholera Infantum	14	2.2	Inflam. of Bowels	18	2.8	Erysipelas	46	3.0
	9	Remittent Fever	3	1.8	Inflam. of Kidney	18	2.9	Inflam. of Brain	46	3.1
	10	Whooping-cough	3	1.8	Cholera Morbus	10	2.7	Cholera Morbus	4	2.0
	(11)							Average	27	2.7
	11	Measles	13	2.4	Dysentery	28	3.2	Tonsillitis	35	2.9
	(12)	Average	23	2.9	Average	25	3.2			
Less.	12	Typhoid Fever (ent.)	28	3.1	Measles	20	3.0	Intermittent Fever	31	3.1
	13	Cholera Morbus	18	2.9	Pneumonia	39	3.8	Typhoid Fev. (ent.)	6	2.5
	14	Inflam. of Kidney	17	2.9	Cholera Infantum	14	3.2	Dysentery	4	2.5
	15	Pheumonia	33	3.7	Puerperal Fever	3	3.0	Pneumonia	23	3.3
		NORTHEASTERN DIV.*			WESTERN DIVISION.*			NORTHERN CEN. DIV.*		
More sickness than Av. for 28 Diseases.	1	Influenza	76	1.5	Neuralgia	75	2.9	Bronchitis	64	3.0
	2	Neuralgia	70	1.8	Influenza	58	2.2	Rheumatism	66	3.4
	3	Rheumatism	68	2.1	Rheumatism	73	3.2	Neuralgia	57	2.9
	4	Bronchitis	74	2.4	Bronchitis	68	3.5	Intermittent Fever	54	2.7
	5	Intermittent Fever	52	2.9	Intermittent Fever	48	2.9	Remittent Fever	48	2.3
	6	Tonsillitis	45	3.7	Tonsillitis	53	3.8	Influenza	39	2.5
	(7)	Average	28	3.0						
	7	Measles	6	2.0	Diarrhea	43	3.4	Tonsillitis	46	4.0
	8	Typhoid Fever (ent.)	2	2.0	Measles	10	2.2	Inflam. of Kidney	1	1.0
	9	Diarrhea	34	3.5	Consumption, Pul.	50	4.1	Diarrhea	23	2.9
	10	Typho-malar'l Fever	1	2.0	Remittent Fever	38	3.8	Pneumonia	34	4.1
	(11)				Average	27	3.6			
	11	Consumption, Pul.	40	4.0	Pneumonia	35	3.9	Measles	27	3.5
	(12)							Average	21	3.4
Less.	12	Inflam. of Bowels	23	3.6	Cholera Infantum	12	3.4	Typhoid Fev. (ent.)	11	2.5
	13	Pneumonia	27	3.8	Pleuritis	26	4.3	Dysentery	10	2.5
	14	Erysipelas	31	4.0	Dysentery	13	3.8	Consumption, Pul.	31	4.6
	15	Dysentery	5	2.8	Typhoid Fev. (ent.)	7	3.6	Scarlet Fever	19	3.9

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* The counties in each division are stated in Exhibit I., page 89.

† Judging from the per cent of reports in connection with the "average order of prevalence where present." *d*, *e*. Foot-notes with these marks are on page 103.

EXHIBIT. VII—CONTINUED.

	Order.†	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per cent of Reports Stating Presence of. d	Av. Order of Prevalence when Pres. e	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per cent of Reports Stating Presence of. d	Av. Order of Prevalence when Pres. e	Diseases in Order of Apparent Amount of Sickness. Most Prevalent Disease First.	Per Cent of Reports Stating Presence of. d	Av. Order of Prevalence when Pres. e
		BAY AND EASTERN DIV.*			CENTRAL DIVISION.*			SOUTHWESTERN DIV.*		
More sickness than Av. for 28 Diseases.	1	Rheumatism	80	3.1	Influenza	52	2.2	Influenza	56	2.0
	2	Neuralgia	77	2.9	Neuralgia	68	2.9	Rheumatism	77	2.8
	3	Bronchitis	72	2.8	Rheumatism	64	2.9	Bronchitis	64	2.7
	4	Consumption, Pul.	70	3.4	Bronchitis	57	2.8	Neuralgia	58	2.8
	5	Influenza	51	2.5	Intermittent Fever	48	2.9	Consumption, Pul.	62	3.5
	6	Diarrhea	47	3.3	Diarrhea	45	2.8	Tonsillitis	49	3.1
	7	Intermittent Fever	43	3.2	Tonsillitis	47	3.3	Diarrhea	35	2.7
	8	Tonsillitis	50	4.2	Remittent Fever	35	2.9	Intermittent Fever	42	3.0
	(9)	Average	30	3.9						
	9	Remittent Fever	22	3.5	Measles	15	2.5	Remittent Fever	26	2.8
	10	Whooping-Cough	12	3.1	Consumption, Pul.	43	3.7	Typho-mal. Fever	14	2.5
	(11)				Average	24	3.2	Average	24	3.0
Less.	11	Pneumonia	34	4.8	Whooping-cough	13	2.5	Scarlet Fever	7	2.5
	12	Cholera Infantum	17	3.9	Pneumonia	26	3.8	Measles	13	2.8
	13	Measles	19	4.1	Dysentery	16	3.4	Cholera Infantum	11	2.8
	14	Cholera Morbus	22	4.4	Cholera Morbus	14	3.4	Pneumonia	29	3.5
	15	Inflam. of Kidney	27	4.9	Inflam. of Kidney	23	3.8	Inflam. of Kidney	15	3.1
		SOUTHERN CENTRAL DIV.*			SOUTHEASTERN DIVISION.*					
More Sickness than Av. for 28 Diseases.	1	Neuralgia	77	2.4	Bronchitis				73	2.1
	2	Rheumatism	76	2.7	Rheumatism				72	2.8
	3	Influenza	61	2.2	Influenza				51	2.0
	4	Bronchitis	64	2.5	Consumption, Pulmonary				59	2.9
	5	Tonsillitis	58	3.0	Neuralgia				55	2.9
	6	Diarrhea	49	2.9	Diarrhea				42	2.7
	7	Intermittent Fever	48	2.9	Intermittent Fever				40	2.7
	8	Consumption, Pul.	44	3.6	Tonsillitis				46	3.4
	(9)				Average				23	3.2
	9	Remittent Fever	36	3.4	Diphtheria				6	2.5
	(10)	Average	26	3.4						
Less.	10	Pneumonia	30	4.0	Cholera Morbus				12	2.9
	11	Cholera Morbus	16	3.4	Typho-malarial Fever				9	2.8
	12	Whooping-Cough	14	3.8	Typhoid Fever (enteric)				8	2.8
	13	Measles	7	3.4	Measles				8	2.8
	14	Dysentery	20	4.3	Remittent Fever				20	3.4
	15	Pleuritis	17	4.1	Pneumonia				26	3.7

*The counties in each division are stated in Exhibit I, page 89.

†Judging from the per cent of reports in connection with the "average order of prevalence where present." *d, e.* Foot-notes with these marks are on page 103.

EXHIBIT VIII.—*Names of Stations where were made the Observations of Meteorological Conditions used in Exhibit X., and following Exhibits, relative to Sickness and Meteorological Conditions in 1890, also the Temperature, Humidity, Cloudiness, Ozone, Velocity of Wind and Atmospheric Pressure, at each Station for which Observations of the given condition are included in the summary statements relative to that condition in said exhibit.*

Stations.* (Those of the U. S. Signal Service in Italics.)	Temperature. Av. Daily Range.	Temperature. Average.	Humidity. Relative.	Humidity. Absolute.	Per Cent of Cloudiness.	Ozone. Day.	Ozone. Night.	Wind, Av. Velocity.	Atmospheric Pressure. Range. Monthly.	Atmospheric Pressure. Range. Av. Daily.	Atmospheric Pressure. Average.
Number of Stations included in Average	19	12	10	10	12	8	8	7	10	12	12
Average	17.28	46.99	79	3.52	56	3.69	3.58	9.7	1.399	.234	29.125
Marquette	14.03							9.4			
Gulliver Lake	19.96	40.63	88	3.06	60				1.408	.239	29.304
Manistee	12.26							8.2			
Traverse City	20.26	45.54	80	3.38	62	6.19	6.22		1.351	.231	29.279
Alpena	13.46										
Harrisville	18.11	42.83			62	4.27	4.97		1.404	.248	29.311
Grand Haven	14.85							11.1			
Port Huron	14.58							11.6			
Thornville	15.64	48.56	80	3.69	51	3.49	3.90		1.406	.264	28.949
Agricultural College	19.78	47.60	76	3.45	55				1.462	.224	29.084
Lansing (S. B. of H.)	19.58	47.89	73	3.39	57	3.77	4.15	9.4	1.395	.230	29.084
Albion	16.26	49.22	77	3.52	62	3.64	3.35		1.424	.228	28.953
Ann Arbor	17.10	48.84	84	3.77	57	3.07	3.04	8.7	1.450	.227	29.083
Otsego	21.99	48.77			51	2.21	2.71				
Kalamazoo	16.97										
Marshall	21.23	48.66	81	3.76	45	2.54	2.29		1.423	.223	29.011
Tecumseh										.222	29.127
Birmingham	20.18	48.51	78	3.73	60				1.451	.232	29.129
Detroit	18.18							9.7			
Alma	19.68	47.89	77	3.50	51					.241	29.197

* Observations of range of temperature were made with registering thermometers read and set at the Signal Service Stations as follows: the maximum at the morning observations, the minimum at the evening observation, at 9 P. M. at Ann Arbor and at 7 A. M. at other stations. For the ozone observations. the test-paper was exposed from 7 A. M. to 2 P. M. for the day observations, and from 9 P. M. to 7 A. M. for the night observations. The velocity of wind was recorded by registering anemometers. These subjects are treated by months in 1890 and for previous years, in an article on Meteorological Conditions in Michigan in 1890, on pages 1-81 of this Report.

TABLE IX.—*Showing Comparisons between the Averages of certain Meteorological Conditions at Stations in Michigan in 1890, with those in preceding Years. (Abstracted from Exhibit 9, page 20; Exhibit 14, page 26 Exhibit 18, page 32; Exhibit 20, page 33; Exhibit 29, page 54; Exhibit 33, page 64; Exhibit 25, page 46; Exhibits 31 and 32, page 57; Exhibit 36, page 78.)*

Meteorological Conditions.		Av.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average Temperature	In 1890 higher than Av. for 13 years, 1877-89	.97	9.57	7.15	......	1.06	......	4.65	.51	......	......	......	2.28	......
	Lower	......	......	......	2.16	......	3.87	......	......	2.75	3.03	.61	......	1.12
Av. Daily Range of Temp.	In 1890 more than Av. for 11 years, 1879-89	......	......	......	......	1.38	......	......	.66	......	......	......	.39	1.14
	Less	.77	.95	4.00	1.96	......	2.59	.47	......	.05	.20	2.56	......	......
Absolute Humidity	In 1890 more than Av. for 13 years, 1877-89	.10	.63	.46	......	.20	......	.90	......	......	......	.13	.14	......
	Less	......	......	......	.07	......	.22	......	.14	.29	.28	......	......	.20
Relative Humidity	In 1890 more than Av. for 12 years, 1878-89	3	5	4	5	8	5	1	......	8	5	7	1	0
	Less	......	......	......	......	......	......	......	8	......	......	......	......	0
Rainfall	In 1890 more than Av. for 13 years, 1877-89	......	1.36	......	......	.91	1.38	......	......	.48	......	1.69	......	......
	Less	5.13	......	.19	.18	......	......	.22	1.89	......	1.24	......	.67	1.02
Velocity of Wind	In 1890 more than Av. for 8 years, 1882-89	.2	1.1	1.2	1.0	.2	.6	......	.6	.2	......	......	......	......
	Less	......	......	......	......	......	......	.5	......	......	.2	.9	.2	.1
Cloudiness	In 1890 greater than Av. for 13 years, 1877-89	0	2	5	......	......	11	0	......	0	3	13	......	......
	Less	0	......	......	2	8	......	0	6	0	......	......	7	10
Day Ozone	In 1890 more than Av. for 13 years, 1877-89	.43	.56	.43	.63	.65	1.25	.90	.37	.42	.42	.06	......	.11
	Less	......	......	......	......	......	......	......	......	......	......	......	.62	......
Night Ozone	In 1890 more than Av. for 13 years, 1877-89	.44	.02	.51	.44	.75	1.26	.89	.67	.77	.85	......	......	.01
	Less	......	......	......	......	......	......	......	......	......	......	.05	.73	......
Atmospheric Pressure	In 1890 more than average for 13 years, 1877-89	......	......	......	......	.060	......	......	......	.014	.029	......	......	......
	Less	.084	.005	.077	.020	......	.101	.021	.007	......	......	.164	.063	.049

CLIMATE AND SICKNESS.*

Exhibit X., page 123, (and similar exhibits in previous Reports) is an attempt to learn something of the relations of bronchitis to meteorological conditions, by noting whether each meteorological condition was above or below its average for the year, in months when more or in months when less bronchitis than the average for the year was reported. The months are arranged in order according to the prevalence of bronchitis; those months in which most bronchitis was reported being placed first in the column: those in which more bronchitis than the average was reported are placed above the average line, the others below that line. The meteorological conditions for each month are printed, in the proper columns, in the line for the month. The statements being thus arranged, it is easy to see whether the temperature, the velocity of the wind, or any other condition represented, was above its annual average in months when more than the average amount of bronchitis was reported, or *vice versa.*

That the comparisons may the more readily be held in mind, propositions have been made concerning the relations of bronchitis to meteorological conditions, grouping the conditions into two classes. The letters *a* and *b* in the Exhibit mark exceptions to these propositions. It is not supposed that the propositions are in every case true concerning every disease; but the propositions serve to bring out the evidence of the exhibit on the subject in question. This evidence is appreciated by noting the number and force of the exceptions to the propositions, and also whether the exception is explained by facts shown in other columns. A summary of the evidence is presented in Exhibit XXIV., near the close of this article.

Exhibits and propositions similar to those relative to bronchitis, but relating to other diseases, are given on following pages. The propositions are differently stated for the summer diseases (beginning with the exhibit on diarrhea) and for the winter diseases (beginning with that on bronchitis), but they are not changed to fit the individual diseases under each class.

RELATIONS OF BRONCHITIS TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were **less** than the average for the year. In Exhibit X., page 123, the letter *a* marks exceptions to this proposition for the year 1890.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of bronchitis, the average daily temperature, and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of bronchitis these conditions were **greater** than the average for the year. In Exhibit X., page 123, the letter *b* marks exceptions to this proposition for months in 1890.

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* The remarks under this head are applicable, also, by changing the name of the disease, to diseases treated in Exhibits XII., XIV., XV., XVI., and XVII., on the following pages. The meteorological data are from places indicated in Exhibit VIII., page 118.

Proposition 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 2, it is true also that the quantity of vapor inhaled daily was **less** than the average, and the quantity exhaled daily in excess of that inhaled was **greater** than the average in months when **more** than the average per cent of reports stated presence of bronchitis; and that **more** vapor was inhaled and a **less** excess exhaled daily in months when the per cent of reports stating presence of bronchitis was **less** than the average.

Proposition 3 also holds true in relation to pneumonia, membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis and pulmonary consumption, treated in Exhibits XII., XIV., XV., XVI. and XVII., on following pages.

What per cent of weekly reports received in 1890 stated presence of bronchitis is graphically represented by months in Diagram 1, page 91.

The evidence of Exhibit X. confirms that of similar exhibits relating to bronchitis in previous years.

What per cent of the reports received stated presence of bronchitis by months in each of the years 1877-90; also the average for 1877-1889, and a comparison of 1890 with that average, are shown in Exhibit XI., page 122.

RELATIONS OF PNEUMONIA AND OTHER "COLD WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

Proposition 1.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis or pulmonary consumption), the average daily range of temperature, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, the average velocity of the wind, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of the reports stated the presence of pneumonia (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibits XII.-XVII., on page 124 and the following pages, the letter *a* marks exceptions to this proposition for the year 1890.

Proposition 2.—That in months when **more** than the average per cent of weekly reports stated the presence of pneumonia (or of membranous croup, diphtheria, tonsillitis, influenza, scarlet fever, rheumatism, neuralgia, pleuritis or pulmonary consumption), the average daily temperature and the absolute humidity of the atmosphere were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of pneumonia (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibits XII.-XVII., on page 124 and following pages, the letter *b* marks exceptions to this proposition for the year 1890.

What per cent of the weekly reports received in 1890 stated presence of pneumonia is graphically represented by months in Diagram 1, page 91.

What per cent of weekly reports received stated presence of pneumonia, and of the other diseases mentioned in the two preceding propositions by months are also given an average for those years and a comparison of 1890 with that average.

From Exhibit XIII., it may be seen that pneumonia was considerably less in 1890 than the average for thirteen years, 1877-89, and also less in each month of 1890, except January, than for the corresponding months of the thirteen years, 1877-89.

The average temperature was slightly higher in 1890, than the average for the thirteen years, 1877-89. It was also higher in each month of 1890, except in March, May, August, September, October and December, than the average in corresponding months in the thirteen years, 1877-89.

The absolute humidity was slightly higher in 1890, than in the average for the thirteen years, 1877-89. It was also higher in each month of 1890, except March, May, July, August, September and December, than the average in corresponding months in the thirteen years, 1877-89.

The relative humidity was more for the year and each month of the year 1890, except July, than the average for the twelve years, 1878-89.

EXHIBIT XI.—SICKNESS FROM BRONCHITIS, 1877-90.—*By Year and Months for each of the Thirteen Years, 1877-89, and for 1890; Stating on what per cent of the Weekly Reports received Bronchitis was reported present, and comparing the Per Cents for 1890, with the Averages for corresponding months in those Years.*

Years, etc.	Annual Av.	January.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.
Average 13 years, 1877-89	60	74	75	75	70	61	52	43	41	48	55	65	69
1877	55	76	72	72	65	45	31	26	22	37	48	71	77
1878	64	77	75	74	71	65	56	41	45	55	60	73	81
1879	64	83	87	83	78	65	54	40	41	50	59	65	77
1880	64	81	84	82	68	59	57	44	45	46	57	67	72
1881	62	81	86	80	78	62	58	35	37	44	44	66	68
1882	65	78	70	75	74	70	62	51	44	57	59	71	71
1883	66	77	80	82	76	70	63	56	53	53	57	61	69
1884	61	71	71	71	65	59	58	49	47	50	58	69	70
1885	56	78	74	76	73	56	52	44	39	45	51	58	62
1886	56	71	69	71	65	57	45	40	37	41	51	61	65
1887	55	67	69	67	62	57	49	41	38	47	57	57	61
1888	59	68	76	74	68	63	55	41	39	49	59	59	65
1889	58	65	68	69	68	61	50	49	44	51	57	64	62
1890	65	71	74	76	74	66	56	50	52	54	65	73	79
In 1890 Greater than Av. 1877-89	5	----	----	1	4	5	4	7	11	6	10	8	10
In 1890 Less than Av. 1877-89	----	3	1	----	----	----	----	----	----	----	----	----	----
In 1890 Greater than Av. 1886-89 *	8	4	8	6	8	6	6	7	12	7	9	13	16
In 1890 Less than Av. 1886-89 *	----	----	----	----	----	----	----	----	----	----	----	----	----

* This comparison is made because of change of plan of reports in May, 1886, as explained on page 88.

EXHIBIT X.—BRONCHITIS.—*Stating for the Year and for each Month of the Year 1890, what Per Cent of the Weekly Reports of Sickness stated Presence of Bronchitis and what where the Meteorological Conditions as observed at Stations in Michigan.**

BRONCHITIS.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone—Relative Scale of 10°.			Amospheric Pressure, Inches Reduced to 32° F.		
														Range.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present.†‡	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Monthly, and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Bronchitis.	Dec.	79	2.3	a14.33	26.65	83	1.60	1.00	10.68	66	a 3.49	a 3.71	10.3	1.015	.315	29.129
	Mar.	76	2.4	a15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.3	1.216	.256	29.132
	Feb.	74	2.7	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a 29.108
	Apr.	74	2.3	20.68	45.23	a 78	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
	Nov.	73	2.3	a14.72	38.60	80	2.46	1.54	10.14	61	a 2.53	a 2.63	10.4	a .813	.287	a 29.112
	Jan.	71	2.7	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
	May	66	2.3	18.00	b52.41	a 74	b 3.72	2.33	9.35	60	4.65	4.83	9.9	a .782	a .195	a 29.020
Av.		65	2.6	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Bronchitis.	Oct.	65	2.6	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a .941	.186	29.028
	June	56	2.5	a19.96	69.93	74	6.23	3.89	7.79	48	a 4.13	a 4.19	7.4	.655	.137	29.069
	Sept.	54	3.1	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a 29.220
	Aug.	52	3.5	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a 29.168
	July	50	2.9	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115

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a An exception to the proposition that more than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was greater than the average for the year; and less in months when the same condition was less than the average. See proposition 1, relating to bronchitis, page 120.

b An exception to the proposition that more than the average per cent of weekly reports stated presence of bronchitis in months when the meteorological condition named at the head of the column was less than the average for the year and less in months when the same condition was greater than the average for the year. See proposition 2, relating to bronchitis, page 120.

[*] How many stations, and what stations are represented in the statements for each meteorological subject may be seen by referring to Exhibit VIII., page 118, in which the stations are named, and a statement for the year 1890, in relation to each meteorological subject, is given for each station included in the average for that subject. In Exhibit VIII., is also stated what time the tri-daily observations were made at each station. Additional statements relative to meteorological conditions may be found in an article on the Principal Meteorological Conditions in Michigan in 1890, on pages 1-81 of this Report.

[†] Explanations of statements in these columns, and other statements relative to the prevalence, in 1890, of the diseases under consideration, may be found in Table 2, pp. 102-111, and 4, 112-113 of this Report, and also in Diagrams 1 (p. 91,) 2, 3, 4, 5 and 6, on following pages. When the per cent of reports stated for any disease is the same for two months or for any month is the same as the average, the order of months in the first column of these exhibits has been determined by reference to fractional per cents.

[‡] Small numbers in this column indicate great prevalence in the localities where the disease occurred, as compared with other diseases; and large numbers a less prevalence.

[§] Calculated from readings of dry bulb and wet bulb thermometers.

[‖] Calculated for 18 respirations per minute, of 20 cubic inches of air each.

[¶] Assuming the air exhaled to be saturated with vapor at the temperature of 98° F., in which case each cubic foot of air contains 18.69 grains of vapor, and 18 respirations per minute, of 20 cubic inches of air each, make 11.68 Troy ounces of vapor exhaled daily. No correction has been made for expansion of air after it is inhaled.

[**] The daily range from which numbers in this column were computed is the difference between the highest and the lowest of the four observations taken during the 24 hours, namely at 7 A. M., 2 P. M., 9 P. M. of one day, and 7 A. M. of the following day, or at U. S. Signal Service Stations at 7 A. M., 3 P. M., 10 P. M., and 7 A. M., seveny-fifth meridian time, as stated in the * foot-note on page 76.

EXHIBIT XII.—PNEUMONIA AND MEMBRANOUS CROUP.—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness Stated Presence of Pneumonia and Membranous Croup, and what were the Meteorological Conditions as observed at Stations in Michigan.**

PNEUMONIA.			Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone. Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
													Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Av. Order of Prevalence Where Present.††	Av. Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Monthly and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Pneumonia.															
Feb.	59	3.9	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a29.108
Jan.	58	4.1	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.409	29.187
Mar.	44	3.8	a15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
Apr.	40	3.7	20.68	45.23	a 73	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
Dec.	39	3.6	a14.33	26.65	83	1.60	1.00	10.68	66	a3.49	a3.71	10.8	1.015	.315	29.129
May.	30	3.4	18.00	b52.41	a 74	b3.72	2.33	9.35	60	4.65	4.83	9.9	a.782	a.195	a29.020
Av.	30	3.9	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Pneumonia.															
Nov.	25	4.1	14.72	b38.60	a 80	b2.46	1.54	10.14	a 61	2.53	2.63	a10.4	.813	a.287	29.112
Oct.	19	4.3	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a.941	.186	29.028
Sept.	14	4.8	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220
June.	14	3.9	a19.96	69.93	74	6.23	3.89	7.79	48	a4.13	a4.19	7.4	.655	.137	29.089
July.	13	3.8	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
Aug.	10	4.5	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168
MEMBRANOUS CROUP.															
More than Av. Per Cent of Membranous Croup.															
Dec.	9	4.5	14.33	26.65	83	1.60	1.00	10.68	66	a3.49	a3.71	10.8	1.015	.315	29.129
Nov.	6	4.2	a14.72	38.60	80	2.46	1.54	10.14	61	a2.53	a.263	10.4	a.813	.287	a29.112
Oct.	5	4.6	a14.67	b48.88	83	b3.66	2.29	9.39	71	a3.09	a3.09	a8.6	.941	a.186	a29.028
Apr.	5	3.5	20.68	45,23	a 73	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
Jan.	4	5.6	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
Mar.	4	4.1	a15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
May	4	5.8	18.00	b52.41	a 74	b3.72	2.33	9.35	60	4.65	4.83	9.9	a.782	a.195	a29.020
Av.	4	4.6	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Ct. of Mem. Croup.															
Feb.	3	5.8	13.99	b30.07	a 86	b1.95	1.22	10.46	a 69	a3.97	a4.57	a11.7	a1.055	a.308	29.108
June.	3	3.8	a19.96	69.93	74	6.23	3.89	7.79	48	a4.13	a4.19	7.4	.655	.187	29.089
July.	2	5.1	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
Aug.	2	5.4	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168
Sept.	2	4.1	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220

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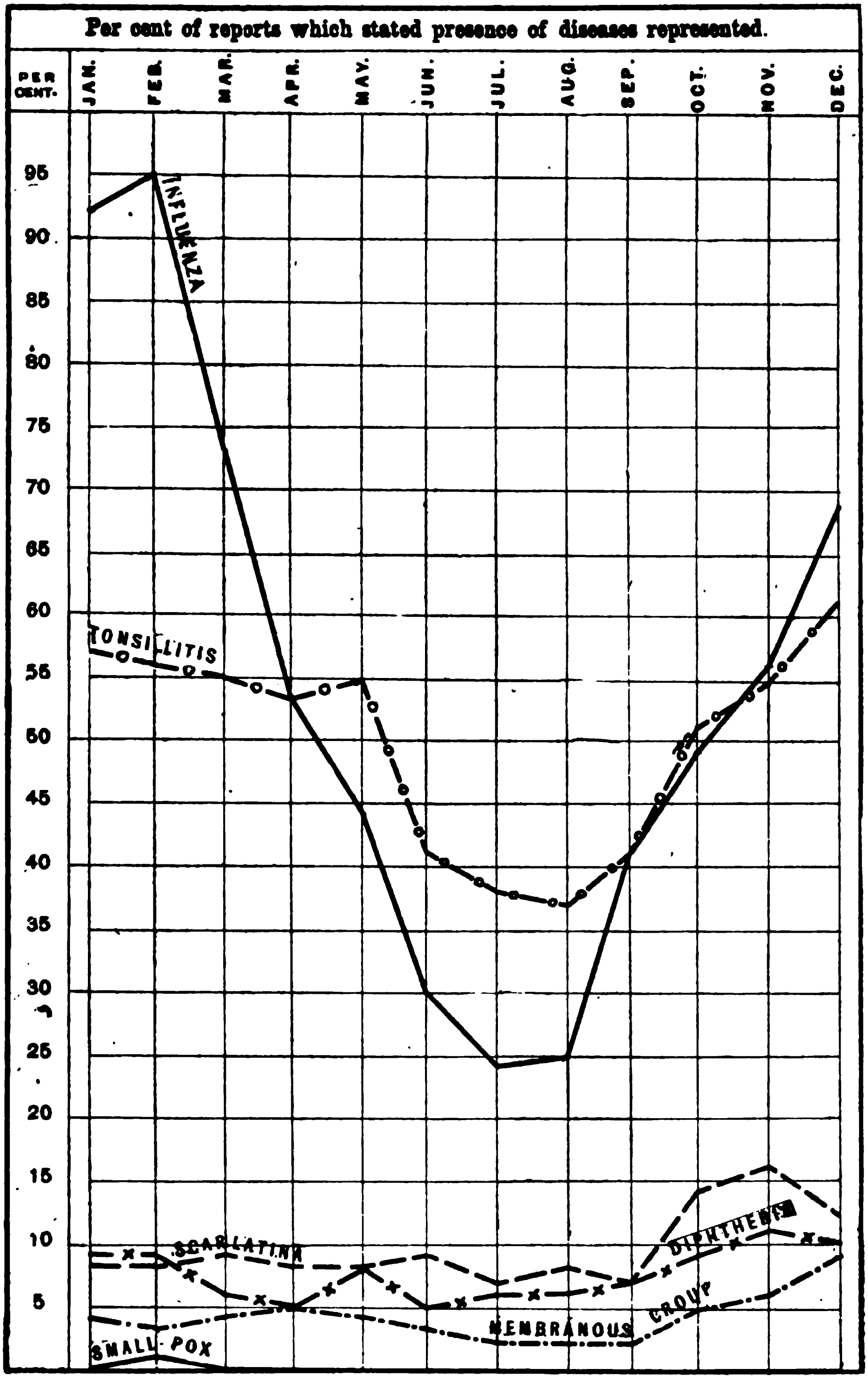
*, †, ‡, §, ‖, ¶, **, For foot-notes with these marks see Exhibit X, page 123.

a An Exception to Proposition 1, relating to Pneumonia and Membranous Croup on page 121.

b An Exception to Proposition 2, relating to Pneumonia and Membranous Croup on page 121.

DIAGRAM 2.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1890.



Comments on Diagram 2, and Exhibit XIII., are at bottom of page 114.

EXHIBIT XIII.—*By Year and Months for 1890 and for the preceding year, and an Average for the thirteen Years 1877-89.*—stating on what Per Cent of the Weekly Reports received,* PNEUMONIA, MEMBRANOUS CROUP, DIPHTHERIA, RHEUMATISM, INFLUENZA, SCARLET FEVER, TONSILLITIS, * AND NEURALGIA * *were Reported Present, and Comparing the Per Cents for Months in 1890, with the Averages for Corresponding Months in that period of years;*† *also comparing the Averages for the Months in 1890, with the Averages for Corresponding Months in the four years, 1886-1889.*‡

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Pneumonia.	Av. 13 years, 1877-89	35	55	60	58	51	38	24	15	13	16	21	32	41	Membranous Croup.	6	11	9	8	7	5	4	2	2	4	6	9	10
	1889	26	41	45	44	38	29	16	11	12	13	23	29	27		3	5	3	4	3	2	1	1	1	2	4	3	4
	1890	30	58	59	44	40	30	14	13	10	14	19	25	39		4	4	3	4	5	4	3	2	2	2	5	6	9
	In 1890 Greater than Av. 1877-89	--	3	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--
	In 1890 Less than Av. 1877-89	5	--	1	14	11	8	10	2	3	2	2	7	2		2	7	6	4	2	1	1	--	--	2	1	3	1
	In 1890 Greater than Av. 1886-9‡	2	16	11	--	--	--	--	2	--		1	--	7		--	--	--	--	--	--	--	1	--	--			3
	In 1890 Less than Av. 1886-9‡	--	--	--	6	1	3	5	--			--	1	--		--	3	2	1	--	--		--	--	1	--	--	--
Diphtheria.	Av. 13 years, 1877-89	18	24	21	18	17	15	13	12	13	14	23	25	24	Rheumatism.	68	72	72	74	74	71	68	61	57	61	67	71	72
	1889	6	9	3	6	5	5	4	3	4	7	11	8	9		65	66	63	66	71	70	69	64	56	60	65	64	67
	1890	8	9	9	6	5	8	5	6	6	7	9	11	10		71	73	69	72	79	78	70	68	62	71	68	74	75
	In 1890 Greater than Av. 1877-89	--	--	--	--	--	--	--	--	--	--	--	--	--		3	1	--	--	5	7	2	7	5	10	1	3	3
	In 1890 Less than Av. 1877-89	10	15	12	12	12	7	8	6	7	7	14	14	14		--	--	3	2	--	--	--	--	--	--	--	--	--
	In 1890 Greater than Av. 1886-9‡	--	--	--	--	--	--	--		--	--	--	--	--		3	4	--	--	5	7	--	7	4	8	--	6	5
	In 1890 Less than Av. 1886-9‡	1	3	1	3	3		1	--	1	1	4	2	1		--	--	1	2	--	--	--	--	--	--	--	--	--
Influenza.	Av. 13 years, 1877-89	38	53	58	57	50	37	27	19	19	27	32	39	46	Scarlet Fever.	16	21	21	21	19	17	15	12	10	11	15	16	16
	1889	32	42	44	48	50	34	22	16	16	21	33	30	37		10	19	11	8	12	13	9	7	4	4	11	10	9
	1890	53	92	95	73	53	44	30	24	25	41	49	56	69		10	8	8	9	8	8	9	7	8	7	14	16	12
	In 1890 Greater than Av. 1877-89	15	39	37	16	3	7	3	5	6	14	17	17	23		--	--	--	--	--	--	--	--	--	--	--	--	--
	In 1890 Less than Av. 1877-89	--	--	--	--	--	--	--	--	--	--	--	--	--		6	13	13	12	11	9	6	5	2	4	1	--	4
	In 1890 Greater than Av. 1886-9‡	20	48	44	20	6	10	6	10	11	19	20	23	30		--	--	--	--	--	--	--	1	3	1	4	6	--
	In 1890 Less than Av. 1886-9‡	--	--	--	--	--	--	--	--	--	--	--	--	--		--	6	3	3	4	3	--	--	--	--	--	--	
Tonsillitis.	Av. 11 years, 1879-89	48	59	60	60	53	46	40	31	31	36	44	55	59	Neuralgia.	66	68	70	72	72	67	64	60	58	59	63	67	69
	1889	46	55	54	54	52	46	39	31	34	35	47	58	57		63	64	65	63	70	65	63	60	55	58	60	66	69
	1890	50	57	56	55	53	55	41	38	37	41	51	55	61		67	68	72	73	75	70	65	61	61	64	65	66	71
	In 1890 Greater than Av. 1879-89	2	--	--	--		9	1	7	6	5	7	--	2		1	--	2	1	3	3	1	1	3	5	2	--	2
	In 1890 Less than Av. 1879-89	--	2	4	5	--	--	--	--	--	--	--		--		--	--	--	--	--	--	--	--	--	--	--	1	--
	In 1890 Greater than Av. 1886-9‡	4		--	--	1	11	4	9	8	6	8	2	5		2	--	3	2	5	4	3	--	3	5	2	--	4
	In 1890 Less than Av. 1886-9‡	--		2	5	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--

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* The average line for tonsillitis and neuralgia includes only the eleven years, 1879-89.

† Other statements for 1890, and months in 1890, relative to these diseases are given in Table 2, pages 102-111, and in Exhibits XII., XIV., XV., and XVI., pages 124, 128 and 129-130 where are also given for convenient comparison statements of coincident meteorological conditions.

‡ This last comparisou is made because of the changes in the plan of making reports, which occurred in May, 1885, as explained on page 83.

DIAGRAM 3 — WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1890.

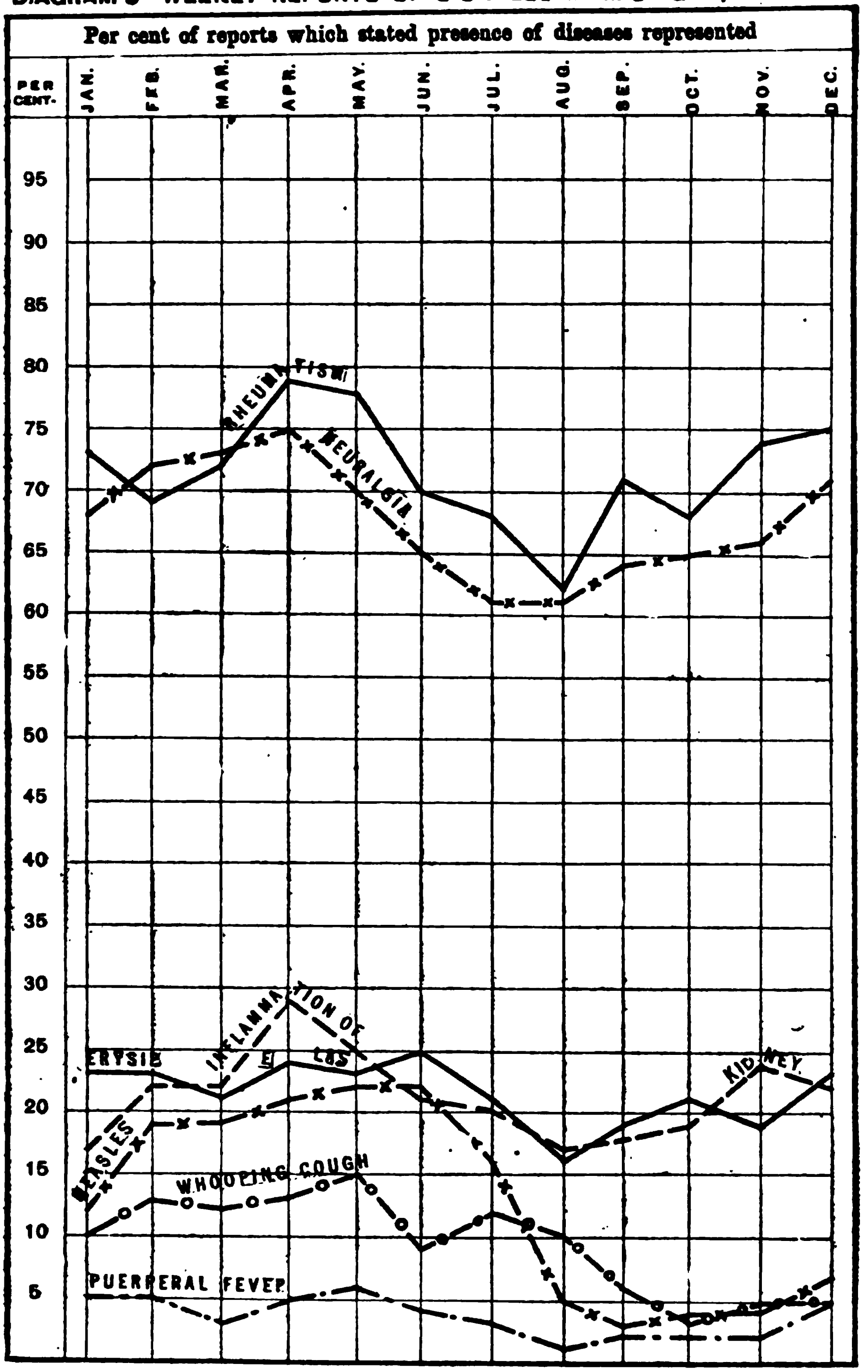

EXHIBIT XIV.—DIPHTHERIA AND TONSILLITIS.—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness Stated Presence of Diphtheria and Tonsillitis, and what were the Meteorological Conditions as Observed at Stations in Michigan.**

Diphtheria.				Temperature. F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.		Av. Per Cent of Cloudiness.	Ozone, Relative Scale of 10°.		Av. Velocity of Wind, Miles per Hour by Anemometer.	Atmospheric Pressure, Inches Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence where Present.††	Average Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶		Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.		Range.		Average Pressure.
														Monthly, and for Year.	Average Daily, by 3 Daily Observations.**	
More than Av. Per Cent of Diphtheria.	Nov.	11	4.1	a14.72	38.60	80	2.46	1.54	10.14	61	a 2.53	a 2.63	10.4	a .813	.287	a29.112
	Dec.	10	4.1	a14.33	26.65	83	1.60	1.00	10.68	66	a 3.49	a 3.71	10.8	1.015	.315	29.129
	Oct.	9	3.3	a14.67	b48.88	83	b 3.66	2.29	9.39	71	a 3.09	a 3.09	a 8.6	.941	a .186	a29.028
	Jan.	9	5.1	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
	Feb.	9	4.5	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a29.108
	May	8	4.5	18.00	b52.41	a 74	b 3.72	2.33	9.35	60	4.65	4.83	9.9	a .782	a .195	a29.020
Av.		8	4.2	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Diphtheria.	Sept.	7	4.0	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220
	March	6	4.5	15.92	b27.47	a 82	b 1.73	1.08	10.60	56	a 4.19	a 4.49	a 11.2	a1.216	a .256	a29.132
	July	6	3.6	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
	Aug.	6	4.8	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168
	April	5	3.6	a20.68	b45.23	73	b 2.93	1.83	9.85	44	a 4.08	a 4.47	a 10.3	a1.200	a .259	a29.195
	June	5	5.0	a19.96	69.93	74	6.28	3.89	7.79	48	a 4.18	a 4.19	7.4	.655	.137	29.089
TONSILLITIS.																
More than Av. Per Cent of Tonsillitis.	Dec.	61	3.1	a14.33	26.65	83	1.60	1.00	10.68	66	a 3.49	a 3.71	10.8	1.015	.315	29.129
	Jan.	57	3.8	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
	Feb.	56	3.9	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a29.108
	March	55	3.6	a15.92	27.47	a 82	1.73	1.08	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
	May	55	3.0	18.00	b52.41	a 74	b 3.72	2.33	9.35	60	4.65	4.83	9.9	a .782	a .195	a29.020
	Nov.	55	3.1	a14.72	38.60	80	2.46	1.54	10.14	61	a 2.53	a 2.63	10.4	a .813	.287	a29.112
	April	53	3.3	20.68	45.23	a 73	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
	Oct.	51	3.2	a14.67	b48.88	83	b 3.66	2.29	9.39	71	a 3.09	a 3.09	a 8.6	.941	a .186	a29.028
Av.		50	3.4	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Tonsillitis.	Sept.	41	3.8	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220
	June	41	3.2	a19.96	69.93	74	6.23	3.89	7.79	48	a 4.13	a 4.19	7.4	.655	.137	29.089
	July	38	3.3	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
	Aug.	37	3.6	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168

*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks see Exhibit X, page 123.

a An Exception to Proposition 1, relating to Diphtheria and Tonsillitis on page 121.

b An Exception to Proposition 2, relating to Diphtheria and Tonsillitis on page 121.

EXHIBIT XV.—INFLUENZA AND SCARLET FEVER.—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness stated Presence of Influenza and Scarlet Fever and what were the Meteorological Conditions as observed at Stations in Michigan.**

INFLUENZA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours Troy Ounces.			Ozone—Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
														Range.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present. ††	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‡	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7. A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Monthly and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Influenza.	Feb....	95	1.2	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a 29.108
	Jan.....	92	1.2	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
	Mar....	78	2.1	a15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	1.216	.256	29.182
	Dec.....	69	1.9	a14.33	26.65	83	1.60	1.00	10.68	66	a 3.49	a 3.71	10.8	1.015	.315	29.129
	Nov....	56	2.1	a14.72	38.60	80	2.46	1.54	10.14	61	a 2.53	a 2.63	10.4	a .813	.287	a 29.112
	Apr....	53	2.5	20.68	45.23	a 73	2.98	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
Av.		53	2.2	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Influenza.	Oct....	49	2.3	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a .941	.186	29.028
	May....	44	2.4	a18.00	52.41	74	3.72	2.33	9.35	a 60	a 4.65	a 4.83	a 9.9	.782	.195	29.020
	Sept....	41	2.7	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a 29.220
	June....	30	2.8	a19.96	69.93	74	6.23	3.89	7.79	48	a 4.13	a 4.19	7.4	.655	.137	29.089
	Aug....	25	3.1	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a 29.168
	July....	24	3.4	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
SCARLET FEVER.																
More than Av. Per Ct. of Scarlet Fever.	Nov..	16	3.4	a14.72	38.60	80	2.46	1.54	10.14	61	a 2.53	a 2.68	10.4	a .813	.287	a 29.112
	Oct..	14	3.1	a14.67	b48.88	83	b 3.66	2.29	9.39	71	a 3.09	a 3.09	a 8.6	.941	a .186	a 29.028
	Dec..	12	4.1	a14.33	26.65	83	1.60	1.00	10.68	66	a 3.49	a 3.71	10.8	1.015	.315	29.129
Av.		10	4.2	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Scarlet Fever.	Mar....	9	5.3	15.92	b27.47	a 82	b 1.73	1.08	10.60	56	a 4.19	a 4.49	a 11.2	a1.216	a .256	a 29.182
	June..	9	3.6	a19.96	69.93	74	6.23	3.89	7.79	48	a 4.13	a 4.19	7.4	.655	.137	29.089
	Apr....	8	4.4	a20.68	b45.23	73	b 2.93	1.83	9.85	44	a 4.08	a 4.47	a 10.3	a1.200	a 2.59	a 29.195
	May....	8	3.9	a18.00	52.41	74	3.72	2.38	9.35	a 60	a 4.65	a 4.83	a 9.9	.782	.195	29.020
	Jan....	8	5.6	15.22	b30.06	a 87	b 2.02	1.26	10.42	a 72	a 3.99	a 3.91	a 12.1	a1.265	a .400	a 29.187
	Feb....	8	5.5	13.99	b30.07	a 86	b 1.95	1.22	10.46	a 69	a 3.97	a 4.57	a 11.7	a1.055	a .808	29.108
	Aug....	8	3.9	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a 29.168
	July....	7	4.8	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
	Sept....	7	4.0	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a 29.220

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*, †, ‡, §, ||, ¶, ** For foot-notes with these marks see Exhibit X, page 123.
a An Exception to Proposition 1, relating to Influenza and Scarlet Fever, on page 121.
b An Exception to Proposition 2, relating to Influenza and Scarlet Fever, on page 121.

EXHIBIT XVI.—RHEUMATISM AND NEURALGIA.—*Stating for the Year and for Each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness Stated Presence of Rheumatism and Neuralgia, and what were the Meteorological Conditions as Observed at Stations in Michigan.**

RHEUMATISM.				Temperature F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours. Troy Ounces.			Ozone. Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced. to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent. of Weekly Reports Stating Presence of.	Av. Order of Prevalence Where Present.†‡	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‡	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observations, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Monthly and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Rheumatism.	Apr.....	79	2.6	20.68	45.23	a 73	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
	May	78	2.5	18.00	b52.41	a 74	b3.72	2.38	9.35	60	4.65	4.83	9.9	a.782	a 195	a29.020
	Dec.....	75	2.9	a14.33	26.65	83	1.60	1.00	10.68	66	a3.49	a3.71	10.8	1.015	.315	29.129
	Nov.....	74	2.6	a14.72	38.60	80	2.46	1.54	10.14	61	a2.53	a2.63	10.4	a.813	.287	29.112
	Jan.	73	3.6	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
	Mar.....	72	3.0	a15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
	Sept. ...	71	2.9	19.67	b58.06	80	b4.59	2.87	8.81	a48	a3.44	a3.14	a8.4	a.729	a.167	29.220
Av.		71	2.9	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Ct. of Rheumatism.	June ...	70	2.5	a19.96	69.98	74	6.23	3.89	7.79	48	a4.18	a4.19	7.4	.655	.137	29.089
	Feb.....	69	3.5	13.99	b30.07	a 86	b1.95	1.22	10.46	a69	a3.97	a4.57	a11.7	a1.055	a.308	29.108
	July	68	2.8	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
	Oct.	68	2.5	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a.941	.186	29.028
	Aug.	62	3.2	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	5.84	.163	a29.168
NEURALGIA.																
More than Av. Per Ct. of Neuralgia.	Apr.....	75	2.3	20.68	45.23	a 73	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.196
	Mar....	73	2.8	a15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
	Feb......	72	3.1	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a29.108
	Dec.....	71	2.7	a14.33	26.65	83	1.60	1.00	10.68	66	a 3.49	a 3.71	10.8	1.015	.315	29.129
	May	70	2.4	18.00	b52.41	a 74	b3.72	2.38	9.35	60	4.65	4.83	9.9	a.782	a.195	a29.020
	Jan.	68	3.0	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
Av.		67	2.7	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Neuralgia.	Nov. ...	66	2.7	14.72	b38.60	a 80	b2.46	1.54	10.14	a 61	2.53	2.63	a10.4	.813	a.287	29.112
	Oct.	65	2.8	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a.941	.186	29.028
	June	65	2.5	a19.96	69.93	74	6.23	3.89	7.79	48	a4.13	a4.19	7.4	.655	.137	29.089
	Sept.....	64	3.0	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220
	Aug.....	61	3.1	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168
	July	61	2.6	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.186	29.115

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*, †, ‡, §, ¶, **, For foot-notes with these marks see Exhibit X, page 123.
a An exception to Propoaiton 1, relating to Rheumatism and Neuralgia, on page 121.
b An Exception to Proposition 2, relating to Rhematism and Neuralgia, on page 121.

EXHIBIT XVII.—PULMONARY CONSUMPTION AND PLEURITIS.—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness Stated Presence of Pulmonary Consumption and Pleuritis and what were the Meteorological Conditions as Observed at Stations in Michigan.**

	CONSUMPTION.			Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone—Relative Scale of 10°.			Amospheric Pressure, Inches Reduced to 32° F.		
														Range.		
	Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.	Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present.†‡	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour by Anemometer.	Monthly, and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Consumption.	April	61	3.1	20.68	45.23	a 78	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
	May	57	3.0	18.00	b52.41	a 74	b3.72	2.38	9.35	60	4.65	4.83	9.9	a.782	a.195	a29.020
	March	55	3.6	a15.92	27.47	82	1.73	1.06	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
	Dec.	55	3.6	a14.33	26.65	83	1.60	1.00	10.68	66	a3.49	a3.71	10.8	1.015	.315	29.129
	Feb.	53	3.9	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a29.108
	June	52	2.9	19.96	b69.93	a 74	a6.28	3.89	7.79	a 48	4.18	4.19	a7.4	a.655	a.137	a29.089
Av.		52	3.5	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Consumption.	Sept.	51	3.7	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220
	Oct.	51	3.4	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a.941	.186	29.028
	Aug.	50	3.7	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168
	Jan.	50	4.2	15.22	b30.06	a 87	b2.02	1.26	10.42	a 72	a3.99	a3.91	a12.1	a1.265	a.400	a29.187
	Nov.	49	3.5	14.72	b38.60	a 80	b2.46	1.54	10.14	a 61	2.53	2.63	a10.4	.813	a.287	29.112
	July	45	3.3	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
	PLEURITIS.															
More than Av. Per Cent of Pleuritis.	Dec.	31	4.0	a14.33	26.65	83	1.60	1.00	10.68	66	a3.49	a3.71	10.8	1.015	.315	29.129
	Mar.	29	4.3	a15.92	27.47	82	1.73	1.06	10.60	56	4.19	4.49	11.2	1.216	.256	29.132
	Feb.	26	4.7	a13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	1.055	.308	a29.108
	Jan.	25	4.8	a15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	1.265	.400	29.187
	April	23	4.1	20.68	45.23	a 78	2.93	1.83	9.85	a 44	4.08	4.47	10.3	1.200	.259	29.195
	May	22	3.9	18.00	b52.41	a 74	b 3.72	2.38	9.35	60	4.65	4.83	9.9	a.782	a.195	a29.020
Av.		19	4.2	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Pleuritis.	Nov.	15	3.7	14.72	b38.60	a 80	b2.46	1.54	10.14	a 61	2.53	2.63	a10.4	.813	a.287	29.112
	June	14	3.9	a19.96	69.93	74	6.28	3.89	7.79	48	a4.18	a4.19	7.4	.655	.137	29.089
	Sept.	14	4.5	a19.67	58.06	a 80	4.59	2.87	8.81	48	3.44	3.14	8.4	.729	.167	a29.220
	Oct.	14	4.2	14.67	48.88	a 83	3.66	2.29	9.39	a 71	3.09	3.09	8.6	a.941	.186	29.028
	July	13	4.1	a21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	.605	.136	29.115
	Aug.	12	4.5	a20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	.584	.163	a29.168

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*, †, ‡, §, ‖, ¶, ** For foot-notes with these marks see Exhibit X, page 123.

a An Exception to Proposition 1, relating to Consumption and Pleuritis on page 121.

b An Exception to Proposition 2, relating to Consumption and Pleuritis on page 121.

EXHIBIT XVIII.—SICKNESS FROM CONSUMPTION.—1878–89.—*By Year and Months for each of the Twelve Years 1878–89:—Stating on what Per Cent of the Weekly Reports received* CONSUMPTION *was Reported Present, and Comparing the Per Cents for 1890 with the Averages for Corresponding Months in that period of Years; also comparing the Averages for the Months in 1890, with the Averages for Corresponding Months in the four Years 1886–1889.*†

Years, Etc.	Annual Av.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
Average for 12 years, 1878–89*	61	62	64	65	66	63	61	59	57	58	60	60	60
1877*	52	50	47	47	53	49	50	43	35	38	34	68	65
1878	71	67	72	76	75	72	68	68	65	70	78	73	71
1879	70	71	71	69	77	74	73	69	67	67	69	67	61
1880	68	65	69	70	72	70	69	66	62	66	66	68	70
1881	71	74	76	73	76	69	68	67	67	70	73	71	67
1882	66	66	68	66	66	69	66	67	63	68	65	62	65
1883	61	69	66	66	65	62	61	59	55	57	58	58	60
1884	63	56	61	66	70	67	65	63	63	63	65	61	58
1885	58	60	68	71	69	58	61	56	52	54	55	56	56
1886	55	61	58	60	61	60	55	51	52	48	51	55	54
1887	51	58	54	61	61	54	48	48	47	45	48	47	50
1888	49	50	51	52	47	53	56	51	49	44	43	44	46
1889	48	49	49	50	50	46	47	47	46	50	52	49	51
1890 (see Diagram on opposite page.)	52	50	53	55	61	57	52	45	50	51	51	49	55
In 1890 Greater than Av. 1878–89	....	....	....	....	....	....	....	....	....	....	....	....	...
In 1890 Less than Av. 1878–89	9	12	11	10	5	6	9	14	7	7	9	11	5
In 1890 Greater than Av. 1886–89†	1	....		....	6	4	1	....	1	4	2		4
In 1890 Less than Av. 1886–89†	....	3		1	....	....	....	4	....	....	....		...

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* As consumption was not printed on the first blanks, nor on all used in 1877, that year is excluded from the average line.

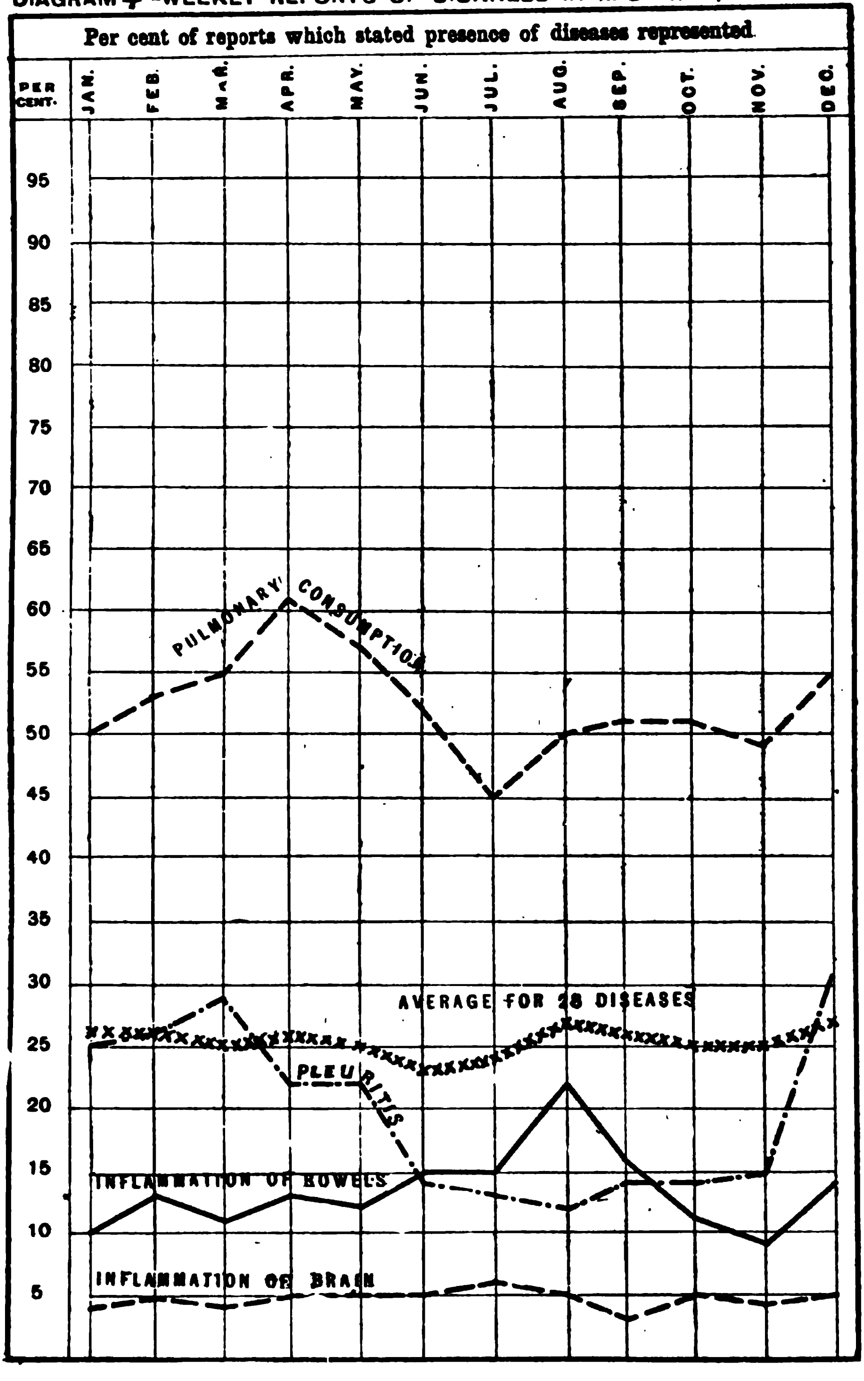
† This comparison is made because of change of plan of reports in May 1885, as explained on pages 83 and 84.

RELATIONS OF DIARRHEA TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **less** than the average for the year. In Exhibit XIX., p. 136, the letter *a* marks exceptions to this proposition for the year 1890.

Explanations of propositions 1 and 2 are given on page 134, and a summary of the evidence in Exhibit XIX. is given in Exhibit XXV., on a following page.

DIAGRAM 4.—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1890.



PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of diarrhea, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of diarrhea, these conditions were **greater** than the average for the year. In Exhibit XIX., page 136, the letter *b* marks the exceptions to this proposition for 1890.

PROPOSITION 3.—For those months which are not, as regards the absolute humidity of the atmosphere, exceptions to Proposition 1, it is true also that the quantity of vapor inhaled daily was **greater** than the average, and the quantity exhaled daily in excess of that inhaled was **less** than the average in months when **more** than the average per cent of reports stated presence of diarrhea; and that **less** vapor was inhaled and a **greater** excess exhaled daily in months when the per cent of reports stating presence of diarrhea was **less** than the average.

Proposition 3 is true also in relation to cholera infantum, intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles and whooping-cough, treated in Exhibits XIX., XXI., XXII., and XXIII., page 136, and following pages.

On what per cent of the weekly reports received, by months in the thirteen years, 1877–1889, the eight foregoing diseases were reported present is stated in Exhibit XX., page 137. In Diagram 1., page 91, is graphically represented by months what per cent of the reports in each month in 1890 stated the presence of diarrhea.

The greatest sickness reported from diarrhea in 1890, was in the months of August, September, July and October.

As shown by Exhibit XX., the reports indicate a slightly decreased prevalence of diarrhea in the year 1890. Compared with the year 1889, there was a slightly decreased prevalence of diarrhea in April, May, August, September, October and November, and in February, March and June there was a marked increase. In January, July and December it was the same. Compared with the corresponding months in the average for the thirteen years, 1877–1889, the per cent of reports of diarrhea was slightly more in March, 1890. In January, February and October the per cent was the same, and for every other month of the year slightly less.

Compared with the average for the four years 1886–9, the per cent of reports of diarrhea were slightly less in 1890, in December the per cent was the same, in January, March, June and October the per cent was slightly more, and for every other month of the year it was slightly less.

The average temperature for the year 1890 was slightly higher than the average for 1877-1889. It was also higher for each month of the year, except in March, May, August, September, October and December than the average for corresponding months in the thirteen years, 1877–1889.

The absolute humidity was slightly greater for the year and for each month of the year, except March, May, July, August, September and December, than the average for 1877–1889. The relative humidity was slightly greater for the year 1890, and for each month of the year, except in July which was less and December which was the same, than the average for the twelve years, 1878–1889.

RELATIONS OF CHOLERA INFANTUM AND OTHER "WARM WEATHER" DISEASES TO METEOROLOGICAL CONDITIONS.

PROPOSITION 1.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the average daily range of temperature, the average daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **less** than the average for the year. In Exhibit XIX,. page 136, the letter *a* marks exceptions to this proposition for the year 1890.

Explanations of propositions 1 and 2 are given on page 134, and a summary of the evidence of Exhibit XIX. is given in Exhibit XXV., on a following page.

PROPOSITION 2.—That in months when **more** than the average per cent of weekly reports stated the presence of cholera infantum (or of intermittent fever, remittent fever, typhoid fever, typho-malarial fever, measles, or whooping-cough), the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and that in months when **less** than the average per cent of reports stated the presence of cholera infantum (or of the other diseases named), these conditions were **greater** than the average for the year. In Exhibit XIX., page 136, the letter *b* marks exceptions to this proposition for 1890.

What per cent of all the weekly reports of sickness in each month in 1890 stated the presence of cholera infantum is graphically represented by months in Diagram 1, page 91. What per cent of the reports received by months in the thirteen years, 1877–89, stated presence of cholera infantum and of the other diseases mentioned in Propositions 1 and 2, is stated in Exhibit XX., page 137.

Cholera infantum was more prevalent during the hot months and in June and October,—August, September and July being the months in 1890 in which more than the average sickness from this disease was reported.

EXHIBIT XIX.—DIARRHEA AND CHOLERA INFANTUM.—*Stating for the Year and for each Month of the Year 1890, what Per Cent of the Weekly Reports of Sickness Stated Presence of Diarrhea and Cholera Infantum and what were the Meteorological Conditions as observed at Stations in Michigan.**

DIARRHEA.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone, Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced, to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.	Av. Order of Prevalence Where Present.†‡	Av. Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Range. Monthly and for Year.	Range. Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Diarrhea.	Aug....	82	1.7	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a .584	a .163	29.166
	Sept...	71	2.1	19.67	58.06	b 80	4.59	2.87	8.81	48	3.44	3.14	8.4	a .729	a .167	29.220
	July...	68	2.1	21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.8	a .605	a .136	a 29.115
	Oct....	54	2.9	a14.67	48.88	b 83	3.66	2.29	9.39	b 71	3.09	3.09	8.6	.941	a .186	a 29.025
Av.		44	2.9	17.38	46.99	79	3.52	2.20	9 48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Diarrhea.	June ..	42	2.9	a19.96	a69.93	b 74	a 6.23	3.89	7.79	b 48	4.18	4.19	b 7.4	.655	.137	29.089
	Mar....	31	3.5	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	a1.216	a .256	a 29.132
	Nov....	31	3.1	14.72	38.60	80	2.46	1.54	10.14	61	b 2.53	b 2.63	10.4	.813	a .287	29.112
	May ..	29	3.5	a18.00	a52.41	b 74	a 3.72	2.33	9.35	60	4.65	4.83	9.9	.782	.195	29.020
	Apr....	28	3.6	a20.68	45.23	b 73	2.93	1.53	9.85	b 44	4.08	4.47	10.3	a1.200	a .259	a 29.195
	Feb....	28	4.0	13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	a1.055	a .308	29.108
	Jan....	27	4.4	15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	a1.265	a .400	a 29.187
	Dec....	27	3.7	14.33	26.65	83	1.60	1.00	10.68	66	b 3.49	b 3.71	10 8	a1.015	a .315	a 29.129
CHOLERA INFANTUM.																
More than Av. Per Ct. of Cholera Infantum.	Aug..	48	3.2	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a .584	a .163	29.168
	Sept.	26	3.2	19.67	58.06	b 80	4.59	2.87	8.81	48	3.44	3.14	8.4	a .729	a .167	29.220
	July..	23	3.2	21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	a .605	a .136	a 29.115
Av.		10	3.5	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Cholera Infantum.	Oct....	8	4.4	14.67	a48.88	83	a 3.66	2.29	9 39	71	b 3.09	b 3.09	b 8.6	a .941	.186	29.028
	June ..	7	3.9	a19.96	a69.93	b 74	a 6.23	3.89	7.79	b 48	4.13	4.19	b 7.4	.655	.137	29.089
	May ...	3	4.6	a18.00	a52.41	b 74	a 3.72	2.33	9.35	60	4.65	4.83	9.9	.782	.195	29.020
	Nov....	3	3.6	14.72	38.60	80	2.46	1.54	10.14	61	b 2.53	b 2.63	10.4	.813	a .287	29.112
	Dec....	3	5.9	14.33	26.65	83	1.60	1.00	10.68	66	b 3.49	3.71	10.8	a1.015	a .315	a 29.129
	Jan....	1	5.3	15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	a1.263	a .400	a 29.187
	Mar....	1	4.3	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	a1.216	a .256	a 29.132
	Apr....	1	1.5	a20.68	45.23	b 73	2.93	1.83	9.85	b 44	4.08	4.47	10.3	a1.200	a .259	a 29.195
	Feb ...	0.3	6.0	13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	a1.055	a .308	29.108

*, †, ‡, §, ||, ¶, **, For foot-notes with these marks see Exhibit X, page 123.

a An exception to Proposition 1, relating to Diarrhea and Cholera Infantum on pages 132, 135.

b An exception to Proposition 2, relating to Diarrhea and Cholera Infantum on pages 134, 135.

EXHIBIT XX.—*By Year and Months for 1890 and for the Preceding Year, and an Average for the Thirteen Years 1877–89:—stating on what Per Cent of the Weekly Reports Received* DIARRHEA, CHOLERA INFANTUM, INTERMITTENT FEVER, REMITTENT FEVER, TYPHOID FEVER, TYPHO-MALARIAL FEVER, MEASLES *and* WHOOPING-COUGH *were Reported Present, and Comparing the Per Cents for 1890 with the Averages for Corresponding Months in that period of years;* also Comparing the Averages for the Months in 1890, with the Averages for Corresponding Months in the four years 1886–1889.†*

	Years, etc.	Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Year.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Diarrhea.	Av. 13 years, 1877-89	46	27	28	29	31	36	44	72	85	79	54	35	28	Cholera Infantum.	13	2	2	2	2	3	10	31	47	35	12	4	2
	1889	45	27	25	29	29	33	37	68	85	77	56	34	27		11	2	1	1	1	1	4	23	44	40	7	2	1
	1890	44	27	28	31	28	29	42	68	82	71	54	31	27		10	1	0.3	1	1	3	7	23	43	26	8	3	3
	In 1890 Greater than Av. 1877-1889	..	=	=	2	..	..	..	..	..	..	=	..	..		..	..	..	..	..	=	..	..	..	..	..	..	1
	In 1890 Less than Av, 1877-89	2	=	=	..	3	7	2	4	3	8	=	4	1		3	1	1.7	1	1	=	3	8	4	9	4	1	
	In 1890 Greater than Av. 1886-9†	..	1	..	2	..	..	1	..	..	..	6	..	=		..	..	..	..	..	..	..	..	..	..	..	=	1
	In 1890 Less than Av. 1886-9†	1	..	1	..	2	5	..	1	1	5	..	3	=		2	1	1	1	1	1	2	7	1	7	1	=	..
Intermittent Fever.	Av. 13 years, 1877-89	66	54	55	58	66	71	73	74	74	74	72	63	56	Remittent Fever.	44	37	36	38	41	42	44	46	53	56	54	44	39
	1889	43	36	33	34	48	41	44	50	51	50	47	42	39		30	26	22	24	30	22	25	30	35	41	42	30	26
	1890	41	33	33	33	40	40	43	44	48	43	45	44	36		27	22	19	20	23	26	26	30	33	31	31	33	29
	In 1890 Greater than Av. 1877-89	..	..	..	..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1890 Less than Av. 1877-89	25	21	22	25	26	31	30	30	26	31	27	19	20		17	15	17	18	18	16	18	16	20	25	23	11	10
	In 1890 Greater than Av. 1886-9†	..	..	..	..	..	..	..	..	..	..	..	=	..		..	..	..	..	..	..	..	..	..	..	..	1	=
	In 1890 Less than Av. 1886-9†	7	8	8	11	11	9	7	9	5	9	6	=	3		6	8	9	9	8	4	4	1	5	10	8	..	=
Typhoid Fever.	Av. 13 years, 1877-89	12	10	8	6	5	5	5	7	13	20	22	20	14	Typho-malarial Fever.	20	16	14	13	12	11	11	15	24	38	40	14	20
	1889	10	8	5	3	3	4	5	5	12	19	25	19	12		16	12	9	10	13	9	8	11	22	31	33	15	12
	1890	8	6	1	2	2	2	5	6	15	15	16	13	7		7	4	2	2	5	6	3	6	14	12	12	7	6
	In 1890 Greater than Av. 1877-89	..	..	..	..	..	..	=		2	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1890 Less than Av. 1877-89	4	4	7	4	3	3	=	1	..	5	6	7	7		13	12	12	11	7	5	8	9	10	26	28	7	14
	In 1890 Greater than Av 1886-9†	..	..	..	..	..	..	=	=	2	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1890 Less than Av. 1886-9†	2	2	5	2	2	2	=	=		4	3	2	4		9	7	8	8	6	3	6	5	7	17	18	13	7
Measles.	Av. 13 years, 1877-89	12	10	13	16	21	25	21	13	6	5	4	6	7	Whooping-cough.	19	18	19	19	17	18	18	21	20	20	17	17	17
	1889	6	5	4	4	7	10	11	7	3	3	4	6	9		16	14	15	19	21	19	15	18	15	18	15	10	12
	1890	12	12	19	19	21	22	22	16	5	3	4	4	7		9	10	13	12	13	15	9	12	10	6	3	5	5
	In 1890 Greater than Av 1877-89	=	2	6	3	=	..	1	3	..	..	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1890 Less than Av. 1877-89	=	..		..	=	3			1	2	=	2			10	8	6	7	4	3	9	9	10	14	14	12	12
	In 1890 Greater than Av. 1886-9†	1	3	6	4	4	4	5	7	4	..	=	..			..	..	..	..	..	..	..	..	..	..	..	..	..
	In 1890 Less than Av. 1886-9†	..	..	..	..	..	..	..	..	..	1	=	2	1		6	3	2	4	2	2	7	6	7	10	10	7	7

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* Other statements for 1890 and months in 1890, relative to these diseases are given in Table 2 pages, 102–110, and in Exhibits XIX., XXI., XXII., and XXIII., pages 136, 138, and 141, where are also given for convenient comparison statements of coincident meteorological conditions. The lines for 1890 are graphically represented in Diagrams 1; page 91; 3, page 127; and 4, page 133.

† This last comparison is made because of the change of making reports, which occurred in May, 1885 as explained on page 83.

EXHIBIT XXI.—INTERMITTENT FEVER AND REMITTENT FEVER.—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness stated Presence of Intermittent Fever and Remittent Fever and what were the Meteorological Conditions as observed at Stations in Michigan.**

INTERMITTENT FEVER.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone—Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present. †‡	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles Per Hour by Anemometer.	Range. Monthly and for Year.	Range. Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Intermittent Fever.	Aug.	48	2.7	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a.584	a.163	29.168
	Oct.	45	2.6	a14.67	48.88	b 83	3.66	2.29	9.39	b 71	3.09	3.09	8.6	.941	a.186	a29.028
	Nov.	44	2.9	a14.72	a38.60	b 80	a2.46	1.54	10.14	b 61	2.53	2.63	b10.4	a.813	.287	a29.112
	July	44	2.7	21.37	71.29	69	5.95	3.72	7.96	35	3.28	3.39	8.3	a.605	a.136	a29.115
	June	43	2.7	19.96	69.98	74	6.23	3.89	7.79	48	b4.13	b4.19	7.4	a.655	a.137	a29.089
	Sept.	43	2.9	19.67	58.06	b 80	4.59	2.87	8.81	48	3.44	3.14	8.4	a.729	a.167	29.220
Av.		41	2.9	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Intermittent Fever.	April	40	3.1	a20.68	45.23	b 73	2.93	1.83	9.85	b 44	4.08	4.47	10.3	a1.200	a.259	a29.195
	May	40	2.6	a18.00	a52.41	b 74	a3.72	2.33	9.35	60	4.65	4.83	b9.9	.782	.195	29.020
	Dec.	36	3.2	14.33	26.65	83	1.60	1.00	10.68	66	b3.49	b3.71	10.8	a1.015	a.315	a29.129
	Jan.	33	3.7	15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	a1.265	a.400	a29.187
	Feb.	33	3.8	13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	a1.055	a.308	29.108
	Mar.	33	3.2	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	a1.216	a.256	a29.182
REMITTENT FEVER.																
More than Av. Per Cent of Remittent Fever.	Aug.	33	3.4	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a.584	a.163	29.168
	Nov.	33	3.1	a14.72	a38.60	b 80	a2.46	1.54	10.14	b 61	2.53	2.63	b10.4	a.813	.287	a29.112
	Sept.	31	3.1	19.67	58.06	b 80	4.59	2.87	8.81	48	3.44	3.14	8.4	a.729	a.167	29.220
	Oct.	31	3.1	a14.67	48.88	b 83	3.66	2.29	9.39	b 71	3.09	3.09	8.6	.941	a.186	a29.028
	July	30	3.0	21.37	71.29	69	5.95	3.72	7.96	35	3.28	3.39	8.3	a.605	a.136	a29.115
	Dec.	29	3.5	a14.33	a26.65	b 83	a1.60	1.00	10.68	b 66	3.49	3.71	b10.8	1.015	.315	29.129
Av.		27	3.2	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Remittent Fever.	May	26	3.4	a18.00	a52.41	b 74	a3.72	2.33	9.35	60	4.65	4.83	9.9	.782	.195	29.020
	June	26	2.7	a19.96	a69.98	b 74	a6.23	3.89	7.79	b 48	4.13	4.19	b7.4	.655	.137	29.089
	April	23	3.0	a20.68	45.23	b 73	2.93	1.83	9.85	b 44	4.08	4.47	10.3	a1.200	a.259	a29.195
	Jan.	22	4.1	15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	a1.265	a.400	a29.187
	Mar.	20	3.4	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	a1.216	a.256	a29.182
	Feb.	19	3.7	13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	a1.055	a.308	29.108

*, †, ‡, §, ‖, ¶, **, For foot-notes with these marks see Exhibit X, page 123.
a An Exception to Proposition 1, relating to Intermittent Fever and Remittent Fever on page 135.
b An Exception to Proposition 2, relating to Intermittent Fever and Remittent Fever on page 135.

DIAGRAM 5—WEEKLY REPORTS OF SICKNESS IN MICHIGAN, IN 1880.

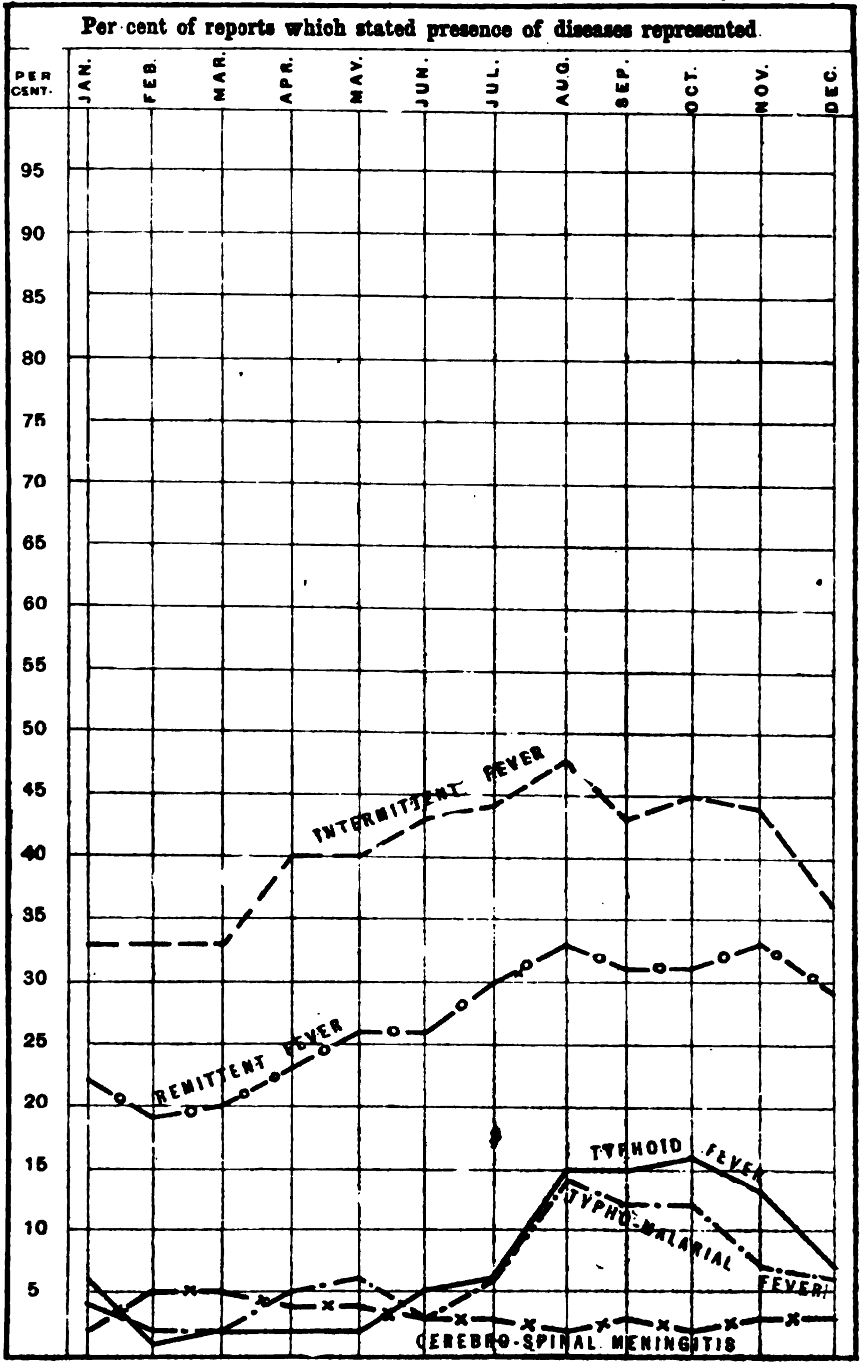

EXHIBIT XXII.—TYPHOID FEVER AND TYPHO-MALARIAL FEVER..—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness Stated Presence of Typhoid Fever and Typho-malarial Fever and what were the Meteorological Conditions as observed at Stations in Michigan.**

Typhoid Fever.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone. Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.	Av. Order of Prevalence Where Present.††	Av. Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Monthly and for Year.	Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Typhoid Fever.	Oct.	16	3.3	a14.67	48.88	b 83	3.66	2.29	9.39	b 71	3.09	3.09	8.6	.941	a .186	a 29.028
	Sept.	15	3.4	19.67	58.06	b 80	4.59	2.87	8.81	48	3.44	3.14	8.4	a .729	a .167	29.220
	Aug.	15	3.6	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a .584	a .163	29.168
	Nov.	13	3.3	a14.72	a38.60	b 80	a 2.46	1.54	10.14	b 61	2.53	2.63	b 10.4	a .813	.287	a 29.112
Av.		8	3.8	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Typhoid Fever.	Dec.	7	4.6	14.33	26.65	83	1.60	1.00	10.68	66	b 3.49	b 3.71	10.8	a1.015	a .315	a 29.129
	Jan.	6	5.2	15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	a1.265	a .400	a 29.187
	July	6	3.1	a21.37	a71.29	b 69	a 5.95	3.72	7.96	b 35	b 3.23	b 3.39	b 8.3	.605	.136	29.115
	June	5	4.4	a19.96	a69.93	b 74	a 6.23	3.89	7.79	b 48	4.13	4.19	b 7.4	.655	.137	29.089
	Mar.	2	4.7	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	a1.216	a .256	a 29.132
	April	2	4.8	a20.68	45.23	b 73	2.93	1.83	9.85	b 44	4.08	4.47	10.3	a1.200	a .259	a 29.195
	May	2	3.8	a18.00	a52.41	b 74	a 3.72	2.33	9.35	60	4.65	4.83	9.9	.782	.195	29.020
	Feb.	1	5.7	13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	a1.055	a .308	29.108
Typho-Malarial Fever.																
More than Av. Per Cent of Typho-malarial Fever.	Aug.	14	3.5	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a .584	a .163	29.168
	Sept.	12	3.6	19.67	58.06	b 80	4.59	2.87	8.81	48	3.44	3.14	8.4	a .729	a .167	29.220
	Oct.	12	3.5	a14.67	48.88	b 83	3.66	2.29	9.39	b 71	3.09	3.09	8.6	.941	a .186	a 29.028
	Nov.	7	2.8	a14.72	a38.60	b 80	a 2.46	1.51	10.14	b 61	2.53	2.63	b 10.4	a .813	a .287	a 29.112
Av.		7	3.6	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Typho-malarial Fever.	May	6	3.2	a18.00	a52.41	b 74	a 3.72	2.33	9.35	60	4.65	4.83	9.9	.782	.195	29.020
	Dec.	6	4.5	14.33	26.65	83	1.60	1.00	10.68	66	b 3.49	b 3.71	10.8	a1.015	a .315	a 29.129
	July	6	2.6	a21.37	a71.29	b 69	a 5.95	3.72	7.96	b 35	b 3.23	b 3.39	b 8.3	.605	.136	29.115
	April	5	3.2	a20.68	45.23	b 7.	2.93	1.83	9.85	b 44	4.08	4.47	10.3	a1.200	a .259	a 29.195
	Jan.	4	5.1	15.22	30.06	87	2.02	1.26	10.42	72	3.99	3.91	12.1	a1.265	a .400	a 29.187
	June	3	3.5	a19.96	a69.93	b 74	a 6.23	3.89	7.79	b 48	4.13	4.19	b 7.4	.655	.137	29.089
	Feb.	2	5.8	13.99	30.07	86	1.95	1.22	10.46	69	3.97	4.57	11.7	a1.055	a .308	29.108
	Mar.	2	2.7	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	a1.216	a .256	a 29.132

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*, †, ‡, §, ‖, ¶, **. For foot-notes with these marks see Exhibit X., page 128.

a An Exception to Proposition 1, relating to Typhoid Fever and Typho-malarial Fever, on page 135.

b An Exception to Proposition 2, relating to Typhoid Fever and Typho-malarial Fever, on page 135.

EXHIBIT XXIII.—MEASLES AND WHOOPING COUGH.—*Stating for the Year and for each Month of the Year 1890, What Per Cent of the Weekly Reports of Sickness Stated Presence of Measles and Whooping-cough and what were the Meteorological Conditions as Observed at Stations in Michigan.**

MEASLES.				Temperature. F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone, Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per Cent of Weekly Reports Stating Presence of.	Average Order of Prevalence where Present.†‡	Average Daily Range by Registering Thermometers.	Average of three Daily Observations.	Relative Per Cent of Saturation.	Absolute—Grains of Vapor in a Cubic Foot of Air.	Inhaled.∥	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Range. Monthly, and for Year.	Range. Average Daily, by 3 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Measles.	May	22	2.7	18.00	52.41	74	3.72	2.33	9.35	b 60	b4.65	b4.83	b9.9	a.782	a .195	a29.020
	June	22	2.9	19.96	69.93	74	6.23	3.89	7.79	48	b4.13	b4.19	7.4	a.655	a.137	a29.089
	April	21	2.8	20.68	a45.23	73	a2.93	1.83	9.85	44	b4.08	b4.47	b10.3	1.200	.259	29.195
	Mar.	19	2.5	a15.92	a27.47	b 82	a1.73	1.08	10.60	56	b4.19	b4.49	b11.2	1.216	.256	29.132
	Feb.	19	3.2	a13.99	a30.07	b 86	a1.95	1.22	10.46	b 69	b3.97	b4.57	b11.7	1.055	.308	a29.108
	July	16	2.9	21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	a.605	a.136	a29.115
	Jan.	12	4.4	a15.22	a30.06	b 87	a2.02	1.26	10.42	b 72	b3.99	b3.91	b12.1	1,265	.400	29.187
Av.		12	3.0	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Measles.	Dec.	7	2.8	14.33	26.65	83	1.60	1.00	10.68	66	b3.49	b3.71	10.8	a1.015	a.315	a29.129
	Aug.	5	4.3	a20.06	a65.28	b 76	a5.46	3.41	8.27	b 43	b3.49	b3.51	b7.9	.584	.163	a29.168
	Oct.	4	3.3	14.67	a48.88	83	a3.66	2.29	9.39	71	b3.09	b3.09	b8.6	a.941	.186	29.028
	Nov.	4	1.7	14.72	38.60	80	2.46	1.54	10.14	61	b2.53	b2.63	10.4	.813	a.287	29.112
	Sept.	3	3.2	a19.67	a58.06	80	a4.59	2.87	8.81	b 48	b3.44	b3.14	b8.4	.729	.167	a29.220
WHOOPING-COUGH.																
More than Average Per Cent of Whooping-cough.	May	15	3.4	18.00	52.41	74	3.72	2.33	9.35	b 60	b4.65	b4.83	b9.9	a.782	a.195	a29.020
	Feb.	13	3.6	a13.99	a30.07	b 86	a1.95	1.22	10.46	b 69	b3.97	b4.57	b11.7	1.055	.308	a29.108
	April	13	3.4	20.68	45.23	73	a2.93	1.83	9.85	44	b4.08	b4.47	b10.3	1.200	.259	29.195
	Mar.	12	3.4	a15.92	a27.47	b 82	a1.73	1.08	10.60	56	b4.19	b4.49	b11.2	1.216	.256	29.132
	July	12	2.8	21.37	71.29	69	5.95	3.72	7.96	35	3.23	3.39	8.3	a.605	a.136	a29.115
	Aug.	10	2.6	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	a.584	a.163	29.168
	Jan.	10	4.4	a15.22	a30.06	b 87	a2.02	1.26	10.42	b 72	b3.99	b3.91	b12.1	1.265	.400	29.187
	June	9	2.3	19.96	69.93	74	6.23	3.89	7.79	48	b4.13	b4.19	7.4	a.655	a.137	a29.089
Av.		9	3.2	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Ct. of Whooping-cough.	Sept.	6	2.2	a19.67	a58.06	80	a4.59	2.87	8.81	b 48	b3.44	b3.14	b8.4	.729	.167	a29.220
	Nov.	5	3.4	14.72	38.60	80	2.46	1.54	10.14	61	b2.53	b2.63	10.4	.813	a.287	29.112
	Dec.	5	3.6	14.33	26.65	83	1.60	1.00	10.68	66	b3.49	b3.71	10.8	a1.015	a.315	a29.129
	Oct.	3	3.8	14.67	a48.88	83	a3.66	2.29	9.39	71	b3.09	b3.09	b8.6	a.941	.186	29.028

*, †, ‡, §, ∥, ¶, **, For foot-notes with these marks see Exhibit X, page 123.
a An Exception to Proposition 1, relating to Measles and Whooping-cough, on page 135.
b An Exception to Proposition 2, relating to Measles and Whooping-cough, on page 135.

COLD WEATHER DISEASES.

EXHIBIT XXIV.—*Summary Relative to Propositions contained in Exhibits X, XII., XIV., XV., XVI., etc., (pages 123-130) concerning Relations by Months in 1890, between Greater or Less than usual Prevalence of Diseases Named, and Certain given Coincident Climatic Conditions.*

Diseases.	Months (inclusive) in which Diseases named were More than Usually Prevalent in 1890.	Months (inclusive) in which Diseases named were Less than Usually Prevalent in 1890.	For the 12 Months of the Year 1890. Number of Months in which Propositions Hold True.*										
			That in Months when Diseases named were more than usually Prevalent the Conditions named below were Greater than Usual, and in Months when less than Usually Prevalent these Conditions were Less than Usual.									That in Months when Diseases named were more than Usually Prevalent the Conditions named below were Lower than Usual, and in Mos. when the Diseases were less than Usually Prevalent these Conditions were higher than Usual.	
						Ozone.			Atmospheric Pressure.				
									Range.				
			For Av. Daily Range of Temp.	Relative Humidity.	Av. Per Cent of Cloudiness.	Day.	Night.	Velocity of Wind.	Monthly.	Average Daily.	Average Daily.	Average Temp.	Absolute Humidity.
Bronchitis	Jan.-May, Nov., Dec.	June-Oct.	3	8	10	9	9	12	9	11	7	11	11
Pneumonia	Jan.-May, Dec.	June-Nov.	4	7	9	10	10	11	10	10	8	10	10
Membran. Croup	Jan., Mar.-May, Oct.-Dec.	Feb., June-Sept	4	8	10	7	7	10	9	9	7	9	9
Diphtheria	Jan., Feb., May, Oct.-Dec.	March, April, June-Sept.	2	9	12	6	6	9	8	8	4	8	8
Tonsillitis	Jan.-May, Oct.-Dec.	June-Sept.	2	8	11	8	8	11	10	10	6	10	10
Influenza	Jan.-Apr., Nov.-Dec.	May-Oct.	2	9	9	8	8	11	10	12	8	12	12
Scarlatina	Oct.-Dec.	Jan.-Sept.	8	8	9	3	3	6	7	7	5	7	7
Rheumatism	Jan., Mar.-May, Sept., Nov.-Dec.	Feb., June-Aug., Oct.	5	8	8	7	7	10	7	9	9	9	9
Neuralgia	Jan.-May, Dec.	June-Nov.	4	7	9	10	10	11	10	10	8	10	10
Consumption	Feb.,-June, Dec.	Jan., July-Nov.	6	5	7	10	10	9	8	8	6	8	8
Pleuritis	Jan.-May, Dec.	June-Nov.	4	7	9	10	10	11	10	10	8	10	10

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* The figures in each of these 11 columns show for how many months out of the twelve months in 1890 the proposition named over the column holds true; thus concerning bronchitis, the proposition relative to average daily range of temperature held true in *only three* months out of the twelve; that relative to average temperature, in eleven out of twelve, etc.

WARM WEATHER DISEASES.

EXHIBIT XXV.—*Summary Relative to Propositions contained in Exhibits XIX., XXI., etc., (pages 136, 138, etc.), concerning Relations, by Months in 1890, between Greater or Less than Usual Prevalence of Diseases named, and certain given coincident Climatic Conditions.*

Diseases.	**Months (inclusive) in which Diseases named were More than Usually Prevalent in 1890.**	Months (inclusive) in which Diseases named were Less than Usually Prevalent in 1890.	For the 12 Months of the Year 1890, Number of Months in which Propositions Hold True.*										
			That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Higher than Usual, and in Months when the Diseases were less Prevalent than Usual these Conditions were Lower than Usual.						That in Months when Diseases named were More Prevalent than Usual the Conditions named below were Less than Usual, and in Months when the Diseases were Less Prevalent than Usual these Conditions were Greater than Usual.				
						Atmospheric Pressure.					Ozone.		
						Range.							
			Av. Daily Range of Temp.	Av. Temperature.	Absolute Humidity.	Monthly.	Av. Daily.	Average Daily.	Relative Humidity.	Av. Per Cent of Cloudiness.	Day.	Night.	Velocity of Wind.
Diarrhea	**July-Oct.**	Jan.-June, Nov.-Dec.	8	10	10	4	2	6	7	9	10	10	11
Cholera Infantum	**July-Sept.**	Jan.-June, Oct.-Dec.	9	9	9	3	3	7	8	10	9	10	10
Intermit. Fever	**June-Nov.**	Jan.-May, Dec.	8	10	10	2	2	4	7	9	10	10	10
Remittent Fever	**July-Dec.**	Jan.-June	6	8	8	4	4	6	5	7	12	12	9
Typhoid Fever	**Aug.-Nov.**	Jan.-July, Dec.	6	8	8	4	4	6	5	7	10	10	9
Typho-mal. Fev.	**Aug.-Nov.**	Jan.-July, Dec.	6	8	8	4	4	6	5	7	10	10	9
Measles	**Jan.-July**	Aug.-Dec.	7	5	5	7	7	5	8	7	1	1	4
Whooping-cough	**Jan.-Aug.**	Sept.-Dec.	8	7	6	6	6	6	9	8	2	2	5
Av. Disease	**Jan., Feb., April, Aug., Sept., Dec.**	Mar., May-July, Oct., Nov.	6	4	4	8	8	10	5	7	6	6	5

* The figures in each of these 11 columns show for how many months out of the twelve months in 1890 the Proposition named over the column holds true, thus, concerning diarrhea, the proposition relative to Average Daily Range of Temperature held true in eight months out of the twelve; that relative to Absolute Humidity ten months out of the twelve, etc.

TOTAL SICKNESS—AVERAGE DISEASE.

"Average disease" is an average of the tabulated diseases reported present on all the cards received and compiled at this office during the year. It is probably equivalent to the actual sickness from all diseases printed on the report cards, and probably represents very nearly the average sickness from all the diseases in the State. A sample of the report cards on which diseases are reported to this office is found on page 84. Twenty-eight diseases are printed on the card. In 1890 there were 4,939 of these card reports received. On some of the cards only one or two diseases were reported present; on others twenty or more were reported present. Had each disease (printed on this card, and only the twenty-eight thus named) been reported present on every card received at this office, there would have been 138,292 reports of diseases present. (This is the product of 4,939 reports received multiplied by 28, the number of diseases printed on the cards, or 100 per cent of the possible disease reports.) There were actually present on the cards received at this office only 33,934 disease reports which 33,934÷138,292 of the possible disease reports that might have been present, is 25 per cent. This 25 per cent represents the actual sickness in the State from the tabulated diseases reported present, or in other words the sickness from "average disease." (See Diagram 4, page 133.)

Exhibit XXVI. serves to indicate the probable actual sickness in the State from the tabulated diseases in each year from 1877 to 1890. It compares the sickness in 1890 by months with the sickness by months in each of the thirteen years 1877 to 1889. It also compares the sickness in 1890, by months with the sickness, by months, in each of the four years, 1886–1889. This last comparison is made because of the change in the plan of reports, which occurred in May, 1885, since which time the plan has been to have reported only the sickness actually observed by the physician who reports. Previous to May, 1885, some reported sickness that, by conference with other physicians, they believed to have occurred. Since May, 1885, the subject is placed upon a scientific basis.

By Exhibit XXVI., it will be seen that the sickness reported in 1890, was, for the year, and for each month of the year, considerably less than the average reported for the thirteen years, 1877–89. That exhibit also shows that, for the year, and for April, May, June, August and October, the sickness reported in Michigan in the year 1890, was the same as the average reported for the four years, 1886–89, and that for January, February, November and December it was greater, and in March, July and September it was less than the average for the four years, 1886–89.

EXHIBIT XXVI.—Sickness from Average Disease.—1877-90.—*By Year and Months for each of the Fourteen Years 1877-90, Stating on an Average for such of the 28 diseases tabulated as were reported present, what Per Cent of the Weekly Reports received stated presence of the Diseases, and comparing the Average Per Cents for Months in 1890 with the Averages for corresponding Months in the Years 1877-1889, also comparing the averages for the Months in 1890, with the averages for corresponding months in the four years, 1886-1889.**

Years, Etc.	Annual Av.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average for 13 years, 1877-89	28	29	29	30	29	27	26	28	31	31	30	28	28
1877	28	27	28	26	24	24	23	26	29	31	30	30	30
1878	30	30	30	31	29	28	26	28	32	35	34	30	32
1879	33	35	36	36	35	30	30	32	37	36	34	34	33
1880	32	32	32	32	31	30	31	34	36	35	32	30	31
1881	33	34	34	32	35	31	30	34	37	36	35	32	31
1882	30	31	30	30	30	29	28	28	30	34	32	31	29
1883	30	30	31	33	33	31	29	29	32	32	29	29	28
1884	29	28	29	30	28	28	29	31	34	34	33	30	29
1885	26	29	29	30	28	25	24	26	27	27	26	26	26
1886	26	26	26	28	27	26	23	26	27	28	25	25	25
1887	25	26	27	28	26	25	24	27	29	26	25	24	24
1888	24	24	26	27	26	24	23	22	25	25	23	22	22
1889	23	23	22	24	23	23	21	24	27	28	26	23	22
1890 (Diagram 4 page 183)	25	26	26	25	26	25	23	24	27	26	25	25	27
In 1890 Less than Av. 1877-89	3	3	3	5	3	2	3	4	4	5	5	3	1
In 1890 Greater than Av. 1886-9*	=	1	1	....	=	=	=	....	=	....	=	1	3
In 1890 Less than Av. 1886-9*	=	....	....	2	=	=	=	1	=	1	=	....	....

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* This last comparison is made because of the change in the plan of making the reports, which occurred in May 1885, as explained on pages 83 and 84.

RELATIONS OF TOTAL AMOUNT OF SICKNESS TO METEOROLOGICAL CONDITIONS.

Proposition 1.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 28 diseases tabulated (in tables on pages 99-113) as were reported present, the average daily range of temperature. the averge daily temperature, the absolute humidity of the atmosphere, the monthly and the average daily range of the barometer, and the average daily pressure of the atmosphere, were **greater** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **less** than the average for the year. In Exhibit XXVII., below, the letter *a* marks exceptions to this proposition for the year 1890.

Proposition 2.—That in months when **more** than the average per cent of weekly reports stated the presence of such of the 28 diseases tabulated as were reported present, the relative humidity of the atmosphere, the average per cent of cloudiness, the ozone, and the average velocity of the wind were **less** than the average for the year; and in months when **less** than the average per cent of reports stated the presence of said diseases those conditions were **greater** than the average for the year. In Exhibit XXVII., below, the letter *b* marks exceptions to this proposition for the year 1890.

What per cent of the weekly reports received in 1890 (on an average for such of the tabulated diseases as were reported present) stated presence of the diseases is graphically represented by months in Diagram 4, page 133.

EXHIBIT XXVII.—AVERAGE DISEASE.—*Stating for the Year and for each Month of the Year 1890, what Per Cent of the Weekly Reports of Sickness stated Presence of Average Disease and what where the Meteorological Conditions as observed at Stations in Michigan.**

Average Disease.				Temperature, F.		Humidity of Air.§ Av. of 3 Daily Observations.		Vapor Inhaled and Exhaled from the Air Passages by one Person in 24 Hours, Troy Ounces.			Ozone—Relative Scale of 10°.			Atmospheric Pressure, Inches Reduced to 32° F.		
														Range.		
Months in Order of Greatest Per Cent of Weekly Reports Stating Presence of.		Per cent of Weekly Reports Stating Presence of.	Average Order of Prevalence Where Present.††	Av. Daily Range by Registering Thermometers.	Average of Three Daily Observations.	Relative Per Cent of Saturation.	Absolute,—Grains of Vapor in a Cubic Foot of Air.	Inhaled.‖	Exhaled in Excess of that Inhaled.¶	Av. Per Cent of Cloudiness.	Day Observation, 7 A. M. to 2 P. M.	Night Observation, 9 P. M. to 7 A. M.	Av. Velocity of Wind, Miles per Hour by Anemometer.	Monthly, and for Year.	Average Daily, by 8 Daily Observations.**	Average Pressure.
More than Av. Per Cent of Average Disease.	Aug.	27	3.4	20.06	65.28	76	5.46	3.41	8.27	43	3.49	3.51	7.9	*a* .584	*a* .163	29.168
	Dec.	27	3.4	*a*14.33	*a*26.65	*b* 83	*a* 1.60	1.00	10.68	*b* 66	3.49	3.71	*b* 10.8	1.015	.315	29.129
	Jan.	26	3.9	*a*15.22	*a*30.06	*b* 87	*a* 2.02	1.26	10.42	*b* 72	*b* 3.99	*b* 3.91	*b* 12.1	1.265	.400	29.187
	Feb.	26	3.7	*a*13.99	*a*30.07	*b* 86	*a* 1.95	1.22	10.46	*b* 69	*b* 3.97	*b* 4.57	*b* 11.7	1.055	.308	*a* 29.106
	Apr.	26	3.2	20.68	*a*45.23	73	*a* 2.93	1.83	9.85	44	*b* 4.08	*b* 4.47	*b* 10.3	1.200	.259	29.195
	Sept.	26	3.3	19.67	58.06	*b* 80	4.59	2.87	8.81	48	3.44	3.14	8.4	*a* .729	*a* .167	29.220
Av.		25	3.3	17.38	46.99	79	3.52	2.20	9.48	56	3.69	3.83	9.7	.905	.234	29.125
Less than Av. Per Cent of Average Disease.	May	25	3.2	*a*18.00	*a*52.41	*b* 74	*a* 3.72	2.33	9.35	60	4.65	4.83	9.9	.782	.195	29.020
	Oct.	25	3.2	14.67	*a*48.58	83	*a* 3.66	2.29	9.39	71	*b* 3.09	*b* 3.09	*b* 8.6	*a* 9.41	.186	29.028
	Nov.	25	3.1	14.72	38.60	80	2.46	1.54	10.14	61	*b* 2.53	*b* 2.63	10.4	8.13	*a* .287	29.113
	Mar.	25	3.4	15.92	27.47	82	1.73	1.08	10.60	56	4.19	4.49	11.2	*a*1.216	*a* .256	*a* 29.132
	July	24	3.2	*a*21.37	*a*71.29	*b* 69	*a* 5.95	3.72	7.96	*b* 35	*b* 3.23	*b* 3.39	*b* 8.3	.605	.136	29.115
	June	23	3.1	*a*19.96	*a*69.93	*b* 74	*a* 6.23	3.89	7.79	*b* 48	4.13	4.19	*b* 7.4	.655	.137	29.089

*, †, ‡, §, ‖, ¶, **, For foot-notes with these marks see Exhibit X, page 123.
a An Exception to Proposition 1, relating to Average Disease on page 145.
b An Exception to Proposition 2, relating to Average Disease on page 145 and 146.

☞ Exhibit XXVII., continued for a series of years, should show what meteorological conditions are on the whole most conducive to health in Michigan, and what are most to be guarded against by residents in Michigan.

COMMUNICABLE DISEASES IN MICHIGAN DURING THE YEAR ENDING DECEMBER 31, 1890.

COMPILED UNDER THE DIRECTION OF THE SECRETARY OF THE STATE BOARD OF HEALTH.

This paper continues a subject treated for the preceding year on pages 155–262 of the Report of the State Board of Health for the year 1890, and for former years in the Reports for those years respectively.

Whenever information is received at this office of the outbreak (in any locality in Michigan) of diphtheria, scarlet fever, typhoid fever, small-pox, measles, whooping-cough, rabies, or glanders, a letter is sent to the health officer of the township, city or village in which the disease is reported to be present (if the name of the health officer has been reported to this office; if not, to the president of the Board of Health), calling his attention (if the report was not received from him) to the reported existence of the disease within his territory, indicating his duties and powers and proper measures to be taken in restricting the disease, transmitting documents of instruction with regard to prevention and restriction of the disease, for distribution among families especially exposed to it,[*] and asking for a report of the methods employed for the restriction of the disease, and the results of efforts for suppressing it—the number of cases and deaths in each outbreak. Except in the cases of typhoid fever, measles, whooping-cough, rabies, and glanders, for which a special form of letter was employed, the form of the letter generally sent during the year 1890 was substantially the same as that printed on pages 251–252 of the Report of the State Board of Health for the year 1884. With this letter was sent a blank form (L) for notice of the first case of a dangerous communicable disease, a blank form (M) for weekly reports during the continuance of the disease, and a blank form (K) for special final report. Those now in use are substantially the same as those printed on pages 253–254 of the Report for 1884. The blank (K) for final report is printed on pages xiii.–xiv. of the Report of this Board for 1888.

The information contained in the above-mentioned blanks when filled and returned to this office by the health officers of localities where dangerous communicable diseases have existed, together with other correspondence in regard to outbreaks of such diseases, are the bases on which the various statements made in this article are founded.

The increasingly large number of replies received in answer to communications in regard to contagious diseases, the general desire manifested by health officers for documents on the restriction of communicable diseases, and the general care taken to send complete reports to this office, show an increasing interest among the people, and a commendable effort on the part of the local health authorities to have every means employed to prevent the spread of communicable diseases. The number of communications which annually pass to and from this office relative to dangerous communicable diseases, has increased nearly one hundred per cent during the last two years.

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[*] It is believed that these documents distributed in this manner are doing great good; for the neighbors of the sick are sufficiently alarmed to read the documents, and are thus led to co-operate in stamping out the disease.

Some evidence of the value of this work may be seen further on in this article, under the heads of "Practical Results in Restricting Diphtheria," and "Practical Results in Restricting Scarlet Fever."

TABLE 1.—*Number of Places in Michigan at which Communicable Diseases were Reported Present During Each Week in 1890.*

Weeks ending:—		Diphtheria.	Scarlet Fever.	Typhoid Fever.	Measles.	Small-pox.
January	4	27	33	18	4	0
	11	30	41	25	8	0
	18	20	19	19	10	0
	25	19	15	9	9	0
February	1	19	16	10	12	0
	8	21	19	12	10	1
	15	21	28	12	14	1
	22	26	31	13	32	2
March	1	29	51	15	42	2
	8	35	37	14	56	0
	15	27	33	10	54	0
	22	30	40	7	55	0
	29	27	30	12	37	0
April	5	26	27	10	47	0
	12	16	16	9	45	0
	19	28	24	5	35	0
	26	26	26	4	41	0
May	3	22	35	9	33	0
	10	25	21	14	42	0
	17	31	21	8	50	0
	24	28	19	13	49	0
	31	28	25	3	52	0
June	7	28	22	10	76	0
	14	20	24	8	41	0
	21	22	27	14	38	0
	28	17	19	9	31	0
July	5	20	16	6	37	0
	12	17	17	8	34	0
	19	17	25	13	25	0
	26	17	22	15	28	0
August	2	18	27	20	24	0
	9	27	21	22	13	0
	16	24	26	30	9	0
	23	26	24	33	11	0
	30	27	25	28	7	0
September	6	30	25	35	10	0
	13	27	30	34	8	0
	20	24	27	33	7	0
	27	26	22	34	7	0
October	4	22	31	41	4	0
	11	26	34	47	6	0
	18	35	34	47	5	0
	25	32	32	41	4	0
November	1	31	32	36	11	0
	8	29	31	30	10	0
	15	37	40	33	10	0
	22	27	38	27	8	0
	29	29	36	26	9	0
December	6	32	45	21	7	0
	13	27	45	17	8	0
	20	29	44	16	13	0
	27	21	37	16	13	0
Average number of places per week		25.48	28.56	19.25	23.96	0.12

ISOLATION AND DISINFECTION RESTRICT DANGEROUS COMMUNICABLE DISEASES.

Table 2 and the accompanying Diagram illustrate the efficacy of isolation and disinfection in restricting the spread of two dangerous communicable diseases; a few remarks relative to the source of the data used in their construction, may be beneficial.

Legislative enactments provide for the establishment of local boards of health in all townships, cities and villages in Michigan. Each of these local boards is required by law to appoint a health officer who shall be an executive officer of that board. Part of the duty of the health officer of each local board is to report, to the Secretary of the State Board of Health, every outbreak of a communicable disease which occurs in his jurisdiction; and to keep the Secretary of the State Board constantly informed respecting every outbreak of such disease. On receipt of outbreak reports from health officers (or from other sources), the Secretary of the State Board immediately sends the health officer in whose jurisdiction the disease is reported to exist, instructions in regard to preventing the spread of the disease, and recommends measures to be adopted to prevent its recurrence. Isolation of those sick with dangerous diseases, and disinfection of all clothing and other articles liable to have become infected with the germs of those diseases, are two of the most strongly-emphasized recommendations of the State Board to local health officers. At the end of an outbreak of a communicable disease, the health officer in whose jurisdiction it occurred is required to make a final report to the office of the State Board, stating the number of cases and deaths which took place during the outbreak, the source of the contagium which caused it, whether or not the preventive measures of isolation and disinfection were resorted to, etc. The information thus obtained is compiled in the office of the Secretary of the State Board of Health, and from the data so obtained, combined with all other data available, Table 2, is constructed; and the accompanying diagram, graphically exhibits the line representing the averages in that table.

The recommendations of the State Board in regard to isolation and disinfection are not strictly followed in all localities, and the evil result of neglecting to do so, is forcibly demonstrated in the diagram and table, which show that the numbers of cases and deaths per outbreak, which occurred in outbreaks where those restrictive measures were neglected, were largely in excess of those in which they were enforced. To illustrate, let us refer to the table, and take scarlet fever in the year 1890. In the outbreaks in which isolation and disinfection were neglected, the average numbers of cases and deaths per outbreak which occurred were respectively 12.70 and 2.38, whereas in those outbreaks in which those measures were enforced, there occurred an average of only 1.52 cases and 0.33 of one death, per outbreak; or more than five times as many cases and seven times as many deaths occurred in outbreaks where isolation and disinfection were neglected, than there were in outbreaks where they were enforced. And this wide difference of results is not peculiar to any one year or disease; but applies to all years and to both of the diseases, represented in the table.

It should be mentioned that in compiling the information received from local health officers in regard to outbreaks of dangerous communicable diseases, on which this table, and similar tables in this article, are based, doubtful statements as to whether or not isolation and disinfection were practiced, are not included.

TABLE 2.—*Exhibiting, in regard to Diphtheria and Scarlet Fever in Michigan, the Average number of Cases and Deaths per Outbreak when Isolation and Disinfection were Enforced, and the same when those Precautionary Measures were Neglected, for the five years, and for each of the five years, 1886–1890.*

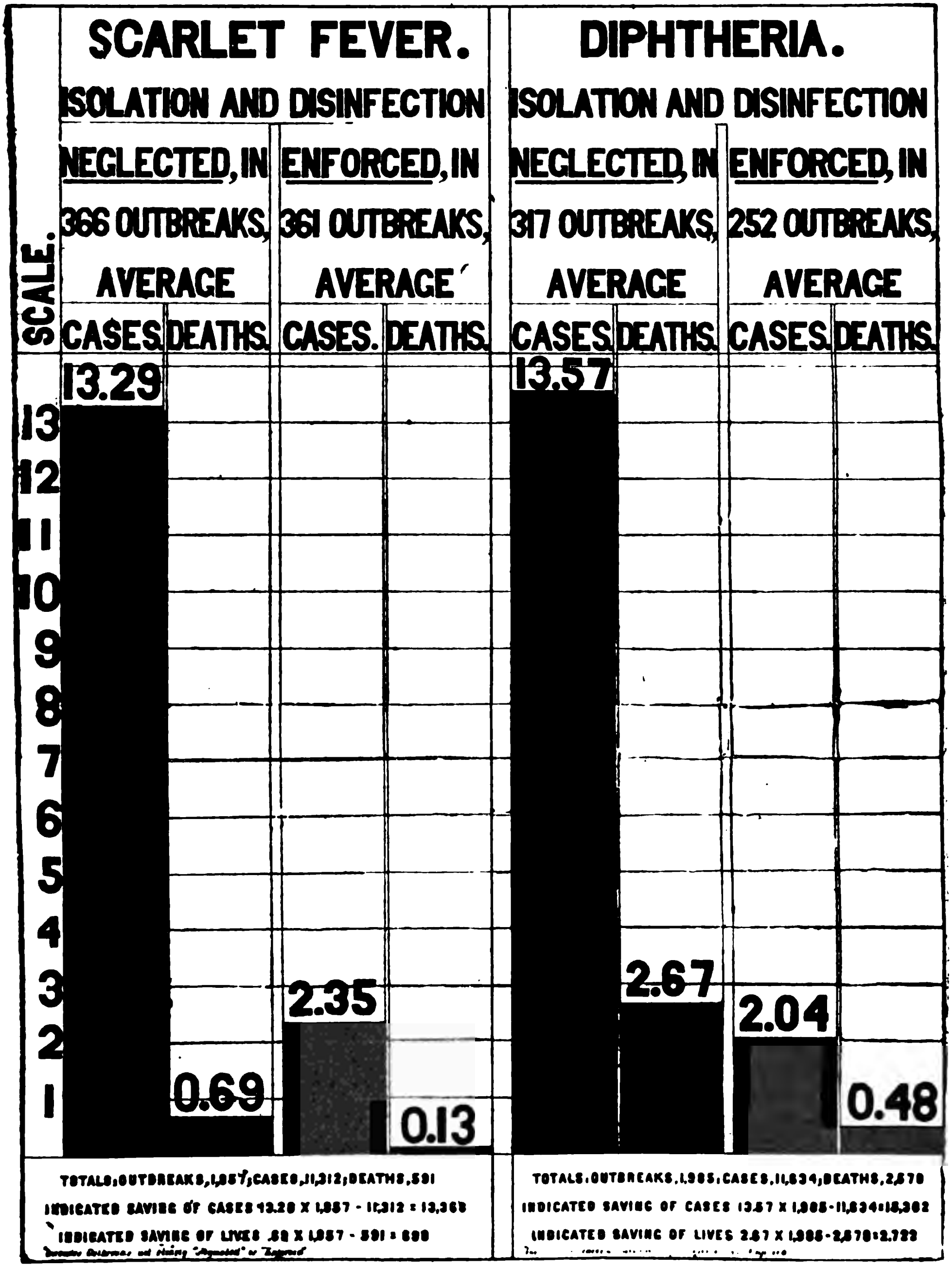
Year.	**Scarlet Fever.**				**Diphtheria.**			
	Isolation and Disinfection Neglected.*		**Isolation and Disinfection Enforced.**		**Isolation and Disinfection Neglected.**		**Isolation and Disinfection Enforced.**	
	Cases.	**Deaths.**	**Cases.**	**Deaths.**	**Cases.**	**Deaths.**	**Cases.**	**Deaths.**
1886	13.84	1.02	2.74	0.19	16.18	3.23	2.86	0.66
1887	11.87	0.82	2.31	0.17	11.79	2.71	2.54	0.65
1888	11.87	0.54	2.22	0.08	15.50	2.38	1.74	0.53
1889	16.78	0.67	2.69	0.19	11.66	2.63	1.56	0.22
1890	12.10	0.38	1.81	0.02	12.70	2.38	1.52	0.33
Av. five years 1886-90	13.29	0.69	2.35	0.13	13.57	2.67	2.04	0.48

* In this double column, the average numbers of cases and deaths given for the years 1886 and 1887, are for all outbreaks in which isolation *or* disinfection *or* both were neglected. In the other three years, 1888-1890, they are, as stated,—for those outbreaks in which isolation and disinfection were both neglected.

The bottom line in this table is graphically exhibited in the diagram on page 151.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

ISOLATION AND DISINFECTION RESTRICTED SCARLET FEVER AND DIPHTHERIA IN MICHIGAN DURING THE 5 YEARS 1886-90.



DIPHTHERIA IN MICHIGAN.—YEAR ENDING DECEMBER 31, 1890.

DISTRIBUTION OF DIPHTHERIA IN 1890.

During the year ending December 31, 1890, there were reported to the office of the State Board of Health 442 outbreaks of diphtheria in 365 localities in Michigan, which resulted in 4,206 cases and 1,050 deaths. Of these, 1,241 cases and 352 deaths occurred in the city of Detroit, and 348 cases and 95 deaths in the city of Grand Rapids; leaving 2,617 cases and 603 deaths as having occurred in the State outside of those two cities. From this it may be seen that 38 per cent of all cases and 43 per cent of all deaths reported as having occurred in the State during the year 1890 occurred in these two cities. The percentage of cases which were reported to have proved fatal, was as follows: For the whole State, 25 per cent; for Detroit and Grand Rapids, combined, 28 per cent; and for the State, exclusive of Detroit and Grand Rapids, 23 per cent. This statement would seem to indicate that the mortality from diphtheria in the two large centers of population, Detroit and Grand Rapids, was proportionately greater than that of the smaller towns and rural districts of the State. This apparent excess of mortality, may, however, be due to mild cases of the disease not having been reported from those cities.

On page 153 is a map of the State of Michigan, which exhibits, for each county, the number of localities where diphtheria was reported to have occurred during the year 1890; also the numbers of outbreaks, cases, and deaths which were reported as having occurred in those localities. This map shows that from six counties—Wayne, Muskegon, Kent, Ottawa, Menominee and Saginaw, whose aggregate population does not exceed 27 per cent of the whole population of the State, there were reported 59 per cent of all cases and 65 per cent of all deaths which occurred in the State during the year; and that from 12 counties—Antrim, Chippewa, Clare, Crawford, Iosco, Isabella, Isle Royal, Kalkaska, Leelanaw, Manistee, Missaukee and Oscoda, containing a joint population of 88,011, there was no case of diphtheria reported during the year.

Table 1.—exhibiting the population, the number of reported cases of diphtheria, and the number of reported cases per 10,000 of population, for each tier of counties in the State, further illustrates the distribution of diphtheria throughout the State during the year.

From this table it may be seen that, for the whole State, the number of reported cases per 10,000 of population was 20.1; and that in the second, fourth and tenth tiers of counties the disease was more prevalent, and in all the other tiers it was less prevalent than the average prevalence for the whole State.

It is a noticeable fact, that although diphtheria was reported from more counties in the Upper Peninsula tier in 1890 than in 1889, the proportionate number of cases to population in that tier was much less in 1890 than in 1889. But no very accurate comparison of different years can yet be made, for reasons stated in the remarks, relative to Table 2, under the heading—"Diphtheria in 1890, compared with previous years."

DISTRIBUTION OF DIPHTHERIA IN MICHIGAN IN 1890.

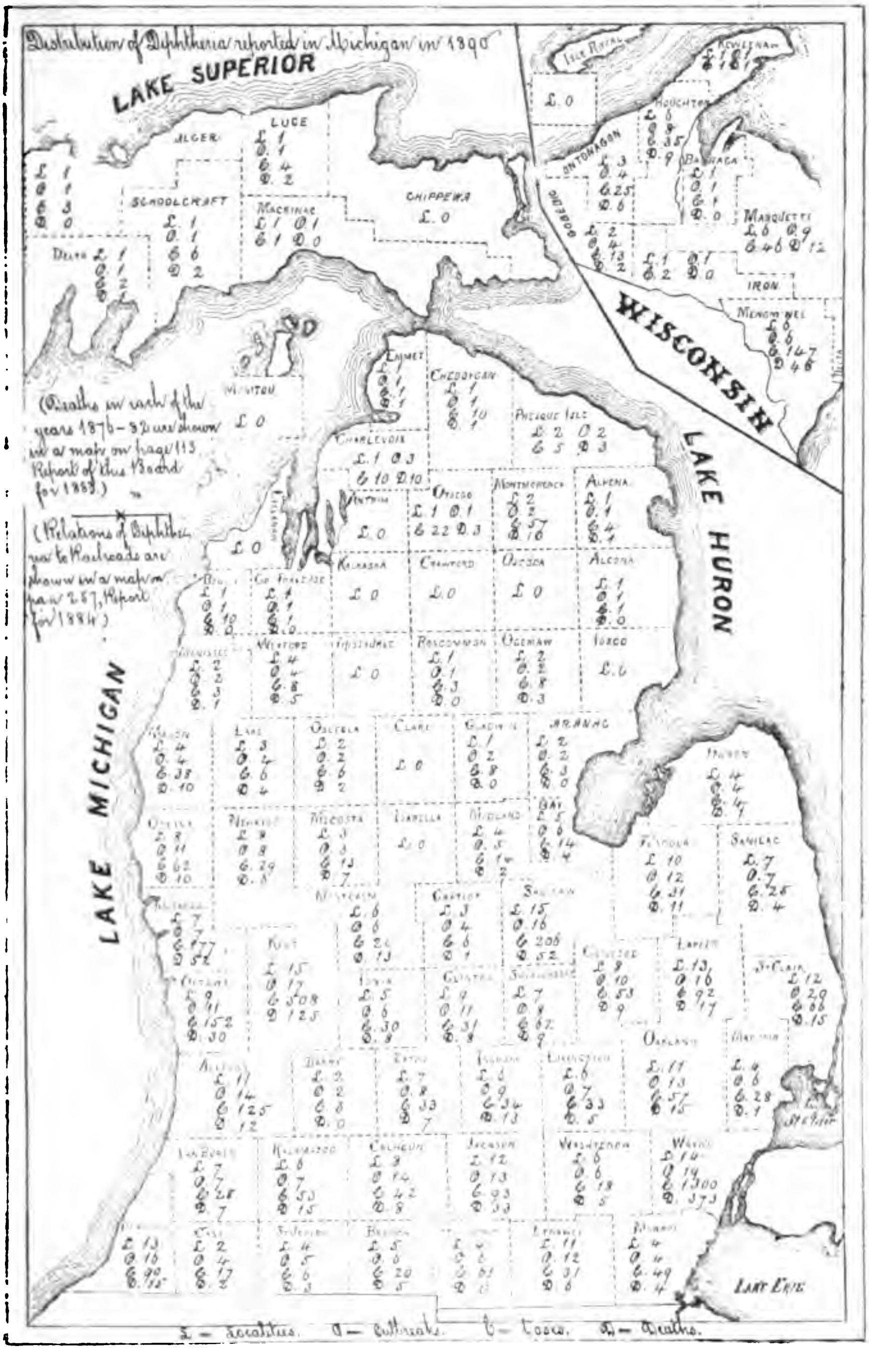

Distribution of Diphtheria reported in Michigan in 1890
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
WISCONSIN
LAKE ERIE
Isle Royal L 0
Keweenaw
Houghton L 6 O 9 C 35 D 9
Ontonagon L 3 O 4 C 25 D 6
Baraga L 1 O 1 C 1 D 0
Marquette L 6 O 9 C 46 D 12
Gogebic L 2 O 4 C 13 D 2
L 1 O 1 C 2 D 0
Iron
Menominee L 6 O 6 C 147 D 46
L 1 O 1 C 3 D 0
Alger
Luce L 1 O 1 C 4 D 2
Schoolcraft L 1 O 1 C 6 D 2
Mackinac L 1 O 1 C 1 D 0
Chippewa L 0
Delta
Emmet L 1 O 1 C 1 D 1
Cheboygan L 1 O 1 C 10 D 1
Presque Isle L 2 O 2 C 5 D 3
Manitou L 0
Charlevoix L 1 O 3 C 10 D 10
Otsego L 1 O 1 C 22 D 3
Montmorency L 2 O 2 C 57 D 16
Alpena L 1 O 1 C 4 D 4
Antrim L 0
Leelanaw L 0
Kalkaska L 0
Crawford L 0
Oscoda L 0
Alcona L 1 O 1 C 1 D 0
Benzie L 1 O 1 C 10 D 0
Gd. Traverse L 1 O 1 C 1 D 0
Manistee L 2 O 2 C 3 D 1
Wexford L 4 O 4 C 8 D 5
Missaukee L 0
Roscommon L 1 O 1 C 3 D 0
Ogemaw L 2 O 2 C 8 D 3
Iosco L 0
Mason L 4 O 4 C 38 D 10
Lake L 3 O 4 C 6 D 4
Osceola L 2 O 2 C 6 D 2
Clare L 0
Gladwin L 1 O 2 C 8 D 0
Arenac L 2 O 2 C 3 D 0
Huron L 4 O 4 C 4
Oceana L 8 O 11 C 62 D 10
Newaygo L 8 O 8 C 29 D 8
Mecosta L 3 O 3 C 13 D 7
Isabella L 0
Midland L 4 O 5 C 14 D 2
Bay L 5 O 6 C 14 D 4
Tuscola L 10 O 12 C 31 D 11
Sanilac L 7 O 7 C 25 D 4
Muskegon L 7 O 7 C 77 D 52
Montcalm L 6 O 6 C 20 D 13
Gratiot L 3 O 4 C 6 D 1
Saginaw L 15 O 16 C 206 D 52
Kent L 15 O 17 C 508 D 125
Ottawa L 9 O 11 C 152 D 30
Ionia L 5 O 6 C 30 D 8
Clinton L 9 O 11 C 31 D 8
Shiawassee L 7 O 8 C 62 D 9
Genesee L 9 O 10 C 53 D 9
Lapeer L 13 O 16 C 92 D 17
St. Clair L 12 O 20 C 68 D 15
Allegan L 11 O 14 C 125 D 12
Barry L 2 O 2 C 8 D 0
Eaton L 7 O 8 C 33 D 7
Ingham L 8 O 9 C 34 D 13
Livingston L 6 O 7 C 33 D 5
Oakland L 11 O 13 C 57 D 15
Macomb L 4 O 6 C 28 D 7
St. Clair
Van Buren L 7 O 7 C 28 D 7
Kalamazoo L 6 O 7 C 53 D 15
Calhoun L 9 O 14 C 42 D 8
Jackson L 12 O 13 C 93 D 33
Washtenaw L 6 O 6 C 19 D 5
Wayne L 14 O 14 C 1300 D 373
L 13 O 16 C 90 D 12
Cass L 2 O 4 C 17 D 2
St. Joseph L 4 O 5 C 6 D 3
Branch L 5 O 6 C 20 D 5
L 4 O 6 C 61
Lenawee L 11 O 12 C 31 D 6
Monroe L 4 O 4 C 49 D 4
(Deaths in each of the years 1876–82 are shown in a map on page 113 Report of this Board for 1883.)
(Relations of Diphtheria to Railroads are shown in a map on page 287, Report for 1884.)
L — Localities. O — Outbreaks. C — Cases. D — Deaths.

TABLE 1.—*Exhibiting the Population of Michigan for the year 1890 by tiers of counties (Upper Peninsula as one tier); also the number of cases of Diphtheria* REPORTED *from each of these divisions for 1890, and the number of cases per 10,000 population of each division.*

Counties in Groups, most Northern ones First.		Population, 1890.*	Reported Cases of Diphtheria, 1890.	Average Reported Cases per 10,000 of Population.
State		2,093,889	4,206	20.1
Upper Peninsula	Alger. Mackinac. Houghton. Marquette. Delta. Chippewa. Ontonagon. Iron. Schoolcraft. Isle Royal. Gogebic. Menominee. Luce. Keweenaw. Baraga.	180,658	286	15.8
Eleventh tier of counties	Manitou. Cheboygan. Emmet. Presque Isle. Charlevoix.	35,975	26	7.2
Tenth tier of counties	Leelanaw. Antrim. Alpena. Otsego. Montmorency.	39,697	83	20.9
Ninth tier of counties	Benzie. Crawford. G. Traverse. Oscoda. Kalkaska. Alcona.	34,027	12	3.5
Eighth tier of counties	Manistee. Wexford. Ogemaw. Missaukee. Iosco. Roscommon.	63,396	22	3.5
Seventh tier of counties	Mason. Gladwin. Lake. Bay. Osceola. Huron. Clare. Arenac.	139,926	79	5.6
Sixth tier of counties	Oceana. Newaygo. Midland. Mecosta. Isabella.	85,812	118	13.8
Fifth tier of counties	Muskegon. Montcalm. Tuscola. Gratiot. Sanilac. Saginaw.	248,688	465	18.7
Fourth tier of counties	Ottawa. Shiawassee. Kent. Genesee. Ionia. Lapeer. Clinton. St. Clair.	356,290	994	27.9
Third tier of counties	Allegan. Livingston. Barry. Oakland. Eaton. Macomb. Ingham.	226,420	313	13.8
Second tier of counties†	Van Buren. Kalamazoo. Washtenaw. Calhoun. Wayne. Jackson.	457,670	1,534	33.5
First tier of counties	Berrien. Hillsdale. Cass. Lenawee. St. Joseph. Monroe. Branch.	225,830	274	12.1

* Taken from U. S. census of 1890.

† Deducting the population of Detroit (205,876) and the number of cases (1,241) reported from that city, the ratio of cases to population in this tier of counties is 11.6 cases per 10,000 population. In the city of Detroit the ratio of reported cases to population is 60.3 cases per 10,000 population.

Statistics show that diphtheria is usually most prevalent during the autumn and winter months, that it is essentially a "cold-weather" disease. This being the case, we might expect to find a greater number of cases of this disease in the Upper Peninsula, where the winters are more protracted, than in more southern portions of the State where the cold-weather seasons are of shorter duration; and this has been the case in former years. It is therefore gratifying to note that in 1890 the number of reported cases per 10,000 inhabitants was less in the Upper Peninsula than the average for the whole State, and also much less than it was in the same section in 1889.

DIPHTHERIA IN 1890, COMPARED WITH PREVIOUS YEARS.

Comparisons with previous years, to ascertain the comparative increase or decrease of prevalence of this disease in the State, would no doubt be interesting and instructive if there existed a fixed basis on which to found such comparisons; but from year to year there has been a steady improvement, both in the methods adopted by the State Board of Health in securing and compiling reports; and in the efforts made by local health authorities throughout the State to furnish in their reports the information desired by the State Board. It is therefore still impossible to determine the exact increase or decrease of prevalence of the disease in the State by comparison of the numbers of outbreaks of the disease, and the cases and deaths resulting therefrom, reported to this office year by year; and this fact should be borne in mind in referring to Table 2.

TABLE 2.—Diphtheria in Michigan: *Numbers of Reported Outbreaks, Localities (in which they Occurred), Reported Cases and Deaths, Average Numbers of Cases and Deaths per Outbreak, and the Per Cent of Cases which proved fatal, as reported for each of the Nine Years, 1882–90; also Averages of the same for the Six Years, 1884–9, and Comparisons of the Facts for 1890 with those for 1889 and with the Averages for the Six Years, 1884–9.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Average Cases per Outbreak.	Reported Deaths.	Average Deaths per Outbreak.	Per Cent of Cases which proved fatal.
1882	....	163	2,046	....	495	....	24.
1883*	....	125	2,246	....	543	....	24.
1884†	362	302	3,915	10.8	905	2.5	23.
1885	467	398	4,018	8.6	964	2.	24.
1886	550	422	4,244	7.7	982	1.8	23.
1887	466	371	3,382	7.3	825	1.8	24.4
1888	337	283	2,228	6.6	532	1.6	23.9
1889	398	329	3,157	7.9	683	1.7	21.6
1890	442	365	4,206	9.5	1,050	2.4	25.
Average for six years, 1884-1889	430	351	3,491	8.2	815	1.9	23.3
Variations in 1890 from 1889	+44	+36	+1,049	+1.6	+367	+0.7	+3.4
Variations in 1890 from the average for six years, 1884-9	+12	+14	+715	+1.3	+235	+0.5	+1.7

* The use of the blank form "M" for weekly reports was begun in May, 1883.

† In compiling diphtheria the use of the annual reports of health officers was begun in 1884.

The above table (2) would seem to indicate that the prevalence of diphtheria in the State during 1890 was greater than in the year 1889. This apparent increase in prevalence of the disease may, however, not be real, but due to the causes before mentioned, namely: increased assiduity on the part of local health officials in reporting all outbreaks of the disease which came to their knowledge, and improved methods of collecting and compiling information at this office.

OUTBREAKS OF DIPHTHERIA BY MONTHS IN 1890.

TABLE 3.—*Exhibiting the number of Outbreaks of Diphtheria beginning and the number ending in each month during the year 1890.*

Outbreaks.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Began	63	42	25	33	43	27	20	35	21	30	35	55
Ended	21	27	27	26	33	23	23	20	20	20	36	56

REPORTED SOURCE OF CONTAGION OF DIPHTHERIA.

Table 4 shows the various sources of the contagium which was believed, by local health officers, to have caused the outbreaks of diphtheria reported to the Office of the State Board of Health as having occurred in the State during the year 1890.

TABLE 4.—*Exhibiting the reported source of contagium, in outbreaks of Diphtheria, which occurred in Michigan in 1890.*

Reported Sources of Diphtheria in 1890.	Number of Outbreaks.
Traced to a former case	90
Probably traced to a former case	8
Unsanitary conditions	25
Bad water	6
Unknown (includes 5 outbreaks reported "sporadic," 5 "taking cold," 1 "empty box car.")	169
Attending school	5
Carried in clothing	6
"Supposed to have been from rags"	4
From infected cats	1
Not reported	128
All outbreaks	442

DIPHTHERIA TRACED TO A FORMER CASE.

Table 4 shows that in 90 instances, local health officers reported having traced the source of contagion to a former case of the disease; and following are given a few extracts from reports of those health officers who so reported.

"This child with its parents attended a funeral of a relative who died of diphtheria in Burr Oak township, St. Joseph Co., Mich., January 29, came home January 31, taken sick February 1, 1890."—*S. B. Follet, M. D., health officer, Sturgis village, St. Joseph Co.*

"Cause of first outbreak at this place—Child and mother went to Escanaba on Thursday, Feb. 13, visited a family where a child had died of diphtheria about a week previous."—*O. E. Nelson, health officer, Ford River township, Delta county.*

"Mrs. Nora Marble, helping in the nursing of a brother-in-law's family, living in Trowbridge township, who lost four children with diphtheria. Mrs. Marble being there day and night as a nurse and came down there with it."—*Stephen S. Stout, M. D., health officer, Chesire township, Allegan county.*

"By going to school with children from Hopkins, Allegan Co., who had not been properly fumigated." —*Victer V. Bacon, M. D., health officer, Dorr township, Allegan county.*

"Of the first two families taken one came from Grand Rapids, Mich., and brought a boy sick with the disease. This family on arrival slept first night with second family taken."—*H. A. Fortuin, M. D., health officer, Overisal township, Allegan county.*

"Communicated from Elkhart, Ind., by Aaron Snelens who came in contact with the disease by trading with a clerk that was sick with diphtheria."—*Wm. N. Reed, M. D. health officer, Calvin township, Cass county.*

"Two small children who had been kept out, were carelessly let in during fourth convalescence, and were taken in 5 and 7 days, were the most severe, and died from it."—*G. S. Peck, M. D., health officer, New Buffalo township, Berrien county.*

"Dr. M. H. Bird, of Millets, came into this family, after having visited the family of M. Saxton, of Lansing township, said there was no danger of taking the disease. Upon this information Mr. Beard, whose child was taken down, visited the family of Saxton to render aid, who also mingled with his family. Twelve days after Bird came the outbreak occurred."—*W. L. Brown, health officer, Delta township, Eaton county.*

"A sister of the patients came from Detroit, who had been caring for a person sick with diphtheria. They all came down about the same time with diphtheria."—*Will L. Cole, M. D., health officer, village and township, Oxford, Oakland county.*

"A child visiting in Kalamazoo was exposed there, returned to this city. The second case was the attending physician. Taken sick 10 days after he began attending the first case."—*A. K. Kimball, M. D., health officer, Battle Creek, Calhoun county.*

"It was taken from a child that was brought here from Drayton Plains."—*Edmund Backman, M. D., health officer, Fenton village, Genesee county.*

TABLE 5.—*Exhibiting the Localities from which Diphtheria was Spread (according to the Official Reports), with the Number of Cases and Deaths, if reported; the Secondary Localities into which the Disease was said to have been introduced from the First (with Number of Cases and Deaths). Compiled from Reports by Health Officers who were able to Trace the Source of Contagium to other Localities.*

First Localities from which Diphtheria spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Allegan county: Trowbridge township	7	2	Allegan county: Cheshire township	10	1
Allegan county: Hopkins township	*	--------	Allegan county: Dorr township	4	2
Berrien county: Three Oaks village	8	3	Berrien county: Three Oaks township	3	3
Berrien county: Lake township	*	--------	Van Buren county: Hartford village	2	0
Branch county	*	--------	St. Joseph county: Burr Oak village	1	0
Delta county: Escanaba city	*	--------	Delta county: Ford River township	2	1
Houghton county: Calumet village	*	--------	Houghton county: Adams township	1	0
Red Jacket village	7	1	Adams township	7	2
Ionia county: Saranac village	*	--------	Ionia county: Odessa township	9	0
Jackson county: Jackson city	58	24	Jackson county: Sandstone township	1	0
			Washtenaw county: Sharon township	1	0
Jackson county: Hanover village	1	0	Jackson county: Pulaski township	4	1
Jackson county	*	--------	Tuscola county: Koylton township	3	3
Kalamazoo county: Kalamazoo city	4	1	Calhoun county: Battle Creek City	4	1
Kent county: Grand Rapids city	348	95	Allegan county: Overisal township	21	4
			Genesee county: Gaines township	23	4
			Kent county: Byron township	26	5
			Cannon township	1	0
			Cascade township	9	0
			Paris township	23	4
			Solon township		1
Montmorency county: Vienna village	*	--------	Lapeer county: Columbia village	1	0
Muskegon county: Muskegon city	150	41	Muskegon county: Fruitland township	7	1
			White River township	3	2
			Laketon township	9	2
			Oceana county: Hesperia village	10	4
Oakland county: Drayton Plains	*	--------	Genesee county: Fenton village	3	3
Oceana county: Shelby village	*	--------	Oceana county: Hart village	2	0

* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

TABLE 5—CONTINUED.

First Localities from which Diphtheria spread.	In "First" Localities.		Secondary Localities Infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Ottawa county: Coopersville village	3	1	Kent county: Walker township	6	1
Saginaw county: Saginaw city	147	31	Genesee county: Richfield township	11	0
			Gratiot county: Wheeler township	1	1
			Midland county: Edenville township	47	7
			Oakland county: Southfield township	3	1
			Saginaw county: Kochville township	17	7
			Tuscola county: Fair Grove township	2	2
			Juniata township	2	2
			Almer township	1	0
St. Clair county: St. Clair city	*	....	St. Clair county: St. Clair township	2	1
St. Clair county: Fort Gratiot	*	....	Macomb county: Richmond village	14	0
			Richmond township	6	0
St. Joseph county: Three Rivers village	*	....	Kalamazoo county: Kalamazoo city	1	0
St. Joseph county: Burr Oak township	1	1	St. Joseph county: Sturgis village	1	1
Tuscola county: Vassar village	*	....	Tuscola county: Fair Grove township	3	0
Tuscola county	*	....	Lapeer county: Lapeer township	1	1
Wayne county: Detroit city	1,241	352	Macomb county: Ray township	1	1
			Oakland county: Oxford township	4	0
			Wayne county: Taylor township	4	1
			Sumpter township	4	3
Wayne county: Livonia township	*	....	Wayne county: Wayne village	7	2
Wexford county: Boon township	1	1	Wexford county: Cadillac city	4	3
(OUTSIDE THE STATE.)					
Canada	....	....	Marquette county: Ishpeming township	2	1
Chicago	....	....	Berrien county: Watervliet township	2	0
			Oakland county: Rochester village	1	1
Elkhart, Indiana	....	....	Berrien county: Berrien township	6	0
			Cass county: Calvin township	21	2
Fort Wayne, Indiana	....	....	Hillsdale county: Cambria township	1	0
Sioux City, Iowa	....	....	Calhoun county: Marshall township	1	0
Ohio	....	....	Lenawee county: Ogden township	2	0
			Palmyra township	2	0
Oregon	....	....	Saginaw county: Tittabawassee township	7	1
Philadelphia	....	....	Ottawa county: Grand Haven township	2	2

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* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred.

In the following three instances the contagium was reported to have been carried to a third locality:

From Saranac village to Odessa township, thence to Berlin township, Ionia county; from Muskegon city, Muskegon county, to Hesperia village, thence to Hart township, Oceana county; and from Canada to Ishpeming township, Marquette county, thence to Ely township, Gogebic county.

From the data contained in Table 5 the following facts are deducible:—

1. That there occurred in the State, during the year 1890, 29 "first-locality outbreaks" of diphtheria, from which 50 other localities were infected with the disease.
2. That in the 50 localities thus infected, 337 cases and 79 deaths are reported to have occurred.
3. That 16, or 55 per cent. of the "first-locality" outbreaks mentioned, were not reported to this Office as required by law.
4. That there occurred 11 outbreaks of the disease, resulting in 47 cases and 7 deaths, the causal contagium of which was brought from "first localities" outside this State.

Examination of the reports made in regard to the 13 "first-locality" outbreaks, which *were* reported to this office, shows that in no instance the preventive and restrictive measures prescribed by the State Board of Health, were fully carried out. It is therefore reasonable to assume that nearly all of the 337 cases and 79 deaths which are reported to have occurred in the 50 "secondary-locality" outbreaks, may be attributed to neglect by health officers, or other persons, who should have controlled the "first-locality" outbreaks from which the contagium spread.

Diphtheria outbreaks probably traced to a former case.

Below are given a few extracts from reports of health officers who probably traced the contagium to a former case.

"I think the disease was brought into Berlin township by a man from Odessa township who had been having it in his family."—*David Gates, health officer, Berlin township, Ionia county.*

"The patient, a boy of 17, had been at work in Vassar, Tuscola county, came home to Fair Grove sick with diphtheria. The disease was, I believe, contracted at Vassar."—*Sylvester J. Smith, M. D., health officer, Fair Grove township, Tuscola county.*

"The suspicion is, that the child's father brought the disease in some bedding he moved with him to this township."—*Joseph Hawkins, health officer, Liberty township, Jackson county.*

"It is uncertain; but supposed to have caught it while in Detroit on a visit."—*Geo. B. Court, health officer, Ray township, Macomb county.*

"The patient clerked in a store in an adjoining village, and sold goods to the mother of a child who had just at that time died of diphtheria."—*D. Patterson, health officer, village of Capac, St. Clair county.*

Diphtheria attributed to unsanitary conditions.

The following extracts are taken from the reports of health officers who attribute the outbreak of diphtheria to unsanitary conditions:

"Filth, as under the room where she slept, the chickens roosted." "Uncleanliness." "Unsanitary condition of premises." "Presumably bad drainage." "Improper drainage of building." "Filthy sewers with an opening directly into the dwelling." "Water under the house." "Cess-pool at the rear end of the kitchen." "Came from filth in a house used for a butcher shop and living house." "By butchering animals and allowing blood and other parts to decay in door-yard." "Rotten vegetables in cellar." "The hovel in which it appears, with its surroundings, seemed fully capable of bringing forth anything that was malignant."

DIFFERENCES IN DIAGNOSIS.

Although fewer instances of error in diagnosing cases of diphtheria have come to the knowledge of the Secretary of this Board during the year 1890, than were reported in the previous year, yet enough such instances have been reported to show that they are still a menace to the preservation of the public health, and to warrant the insertion, here, of the following paragraph, bearing on this subject, which was printed under this head in the Annual Report of the Secretary of this Board for the year 1890:

"Experience seems to indicate that in the adult person, diphtheria is not, as a rule, characterized by the presence of the false membrane; and that, if present, the patches are likely to be small and not to continue visible for any considerable length of time. Irrespective of age, "benignant cases" of the disease may occur, where there is catarrhal manifestations; but no formation of membrane. Still others where a membrane forms on organs other than those of the throat, and thus escapes detection. The true diphtheritic nature of these mild forms of the disease being frequently unrecognized, the disease is not treated as anything serious, a physician is not called, or when one is called, the mild form of the disease awakens doubt as to its true nature. From just such mild cases, contagium may be imparted, especially to children, which may develop diphtheria in its most malignant form; therefore, whenever there is any question as to the diphtheritic nature of the disease, the patient should be isolated, and disinfection resorted to, with as much care and thoroughness as in undoubted cases of diphtheria."

The above-mentioned mild forms of diphtheria seem to be a prolific cause of the spread of the disease in Michigan. The following extracts from reports of local health officials, received at the office of the Secretary of the State Board of Health, give instances where outbreaks of the disease have been attributed to just such mild cases:

1.—"The disease was contracted in the lumber camp of Mr. Bliss, of Saginaw. * * * The first case of throat trouble in camp occurred about three weeks ago, and he remained in camp. Since, a number of the boys have been taken with what they supposed was common sore throat and have gone home. This young man arrived here Saturday, December 13, and stopped in the family of his sister from Saturday till Monday, thus exposing three small children. He then goes home and I was called in attendance Tuesday A. M. Found membrane occluding nostrils, also large patches on fauces, tonsils and uvula; and talking was very difficult."

2.—"The mother of the family whom this report concerns, did a washing for a neighbor whose children had what was called tonsillitis, where there were patches upon throat, and one child died, of other complications it was claimed."

3.—"A boy visiting in Fort Gratiot came home and had very mild diphtheria. This case was not isolated, as it was not reported to me."

4.—"Relative to the non-employment of general preventive measures in this last case, would say the case was deemed so light that such measures were not considered necessary."

5.—"It started from one man contracting it in Grand Rapids, 10 miles away; besides it has been in a mild form among families that would not report it."

6.—"From a young lad that worked one week in a new camp in the lumber woods, and came home with a slight sore throat. One week after his sister had diphtheria very severely."

In the six outbreaks relative to which the above-quoted statements were made, an aggregate of 51 cases of sickness and 8 deaths from diphtheria were reported to have occurred. This seems to forcibly demonstrate the extreme danger of neglecting the adoption of precautionary and preventive measures recommended by the State Board of Health; and especially of those recommendations promulgated in resolutions passed by the Board Jan. 10, 1888 and Feb. 7, 1889, and which were printed in the Annual Report of the Board for 1890 (page 168.)

HOW DIPHTHERIA IS SPREAD,—TRANSGRESSIONS OF PUBLIC HEALTH LAWS.

Frequently reports reach this office of persons infected with the contagium of diphtheria being permitted, in violation of the health laws of the State, to go from one family to another, to go upon the public streets, or to public or social gatherings, to go from one jurisdiction to another, and to travel upon the railroads, etc. To these transgressions of the laws, we can ascribe a large percentage of the outbreaks of this disease in our State. In many instances health officers fail to thoroughly isolate patients or to disinfect their rooms and clothing, thereby allowing the germs of the disease to remain, to cause other outbreaks at some future time; others allow public funerals, or the bodies of decedents from diphtheria to be conveyed from one point to another, scattering the contagium of the disease through the land.

Other lamentable facts in regard to this subject are, that the proper authorities sometimes fail to comply with the law which provides for the appointment of health officers in their jurisdictions; and that physicians and householders transgress the law by neglecting to report to their health officers, cases of communicable diseases which come to their knowledge, or occur in their houses; and that householders fail to coöperate with health officers in their efforts to restrict communicable diseases; and even resist their attempts to stamp out those diseases by the performance of duties prescribed to them by law.

The following are extracts from letters and reports received at this Office, bearing on this subject:—

Edwin Sterne, health officer of Ely township, Marquette county, wrote to the Secretary of this board as follows:—

"We have 3 new cases of diphtheria. Since I sent in report in regard to the Leffeman family, the child died Saturday, and in this case we were not notified until that day; and when the doctor got there the child was dying, and upon inquiry by the Doctor, he found that the child had been exposed to the disease in Ishpeming, and the doctor there had the parents take the child home on the cars, some six miles. Since the child died there have three more children taken the disease; two in the family of Charles Leffeman, brother of the one that lost the child, and one in a family by the name of LaPuchee."

In regard to the source of contagium in an outbreak of diphtheria, M. W. Danforth, health officer of Cascade township, Kent county, wrote:—

"By the children from a family that had a case of the disease being sent from Grand Rapids to our town, to get them away from the contagion; but not soon enough."

Mr. Barney Nadeau, of Nadeau township, Menominee county, writing to F. W. Senseba, health officer of that township, says:—

"The diphtheria sick are no better. There has been one new case right in town * * *, a little girl next to the postoffice; and the doctor says she will die. Everybody is going in and out of that house just as if there was no sickness there. I think it would be well for you to come up and take measures to stop them."

From Nadeau township, there were 29 cases of sickness and seven deaths from diphtheria reported during the year, and the health officer in reporting says:—

> "The people who were afflicted are a very ignorant class of people, which has made it a physical impossibility to do a thorough job disinfecting."

A. G. Cowles, M. D., health officer of Durand, Shiawassee county, wrote to this office, in regard to an outbreak of diphtheria, as follows:—

> "A young man about 18 years old, living on the county line between Shiawassee and Genesee counties, was taken with diphtheria. He was kept at home about three weeks by order of health officer Dr. Covey, of Swartz Creek. After that time he went to stay with his sister, Mrs. Lapham, in the township of Burns Shiawassee county. * * * Nine days after he came there, their little boy, 8 years old, became sick with diphtheria in malignant form, and in a few days died. As soon as I heard of the outbreak, I went to investigate, as it was on the town line between Burns and Vernon townships. I found a case of malignant diphtheria. I used what means I could to protect the neighbors, as fumigating and cleaning and disinfecting cellars and getting things in a sanitary condition as much as possible to prevent the spreading of the disease. In two days an outbreak was reported at Mr. Fox's, the nearest neighbor to Mr. Lapham. This was the 29th of January. On the 2nd of February two more cases were reported at Mr. Fox's, making three cases in the one family, and in this township. Every known means were used by the family and myself to prevent the spreading, and, assisted by Dr. Austin, of Gaines (the physician who treated them), were successful, as only three cases appeared in a family of seven, showing that isolation and fumigation are of great benefit. * * * The Myers boy, who brought it to Lapham's, went home when Lapham's child first came down with diphtheria, and about the middle of February carried an old vest (too small for him) to a neighbor, and gave it to a boy living in this township. In eight days this family had an outbreak of diphtheria, and five small children were sick; showing, all through, extreme contagium of diphtheria and the need of thorough fumigating and disinfecting after an outbreak of that disease, and also that two outbreaks of diphtheria were thus traced in this township, to the one Myers boy going from home before the germs were entirely gone. The five children all lived, but it was a long and tedious task to care for them, and to keep them isolated from the community, but it was held, and the Myers boy ordered to stay at home. All went well only Mr. Fox's people were convalescent a long time and finally went to school. But April 8, one, a young girl 14 years old, came down with diphtheria and in ten days died, and Dr. Austin, the attending physician, buried her, as the board refusing, on the 2nd, to allow my account for services as health officer, I resigned, and the board had neglected to appoint another health officer. After she was buried, it was found out that about a week before she was taken the last time, she went to Mr. Lapham's, and Mrs. Lapham showed her some of the things that belonged to her boy, spoken of above as having died with diphtheria, and among others, some hair which she cut from his head after he died; thus showing again the danger of slack renovation and disinfection, for it might have been from the Lapham house that she contracted the last attack.
>
> "I write this lengthy report thinking it may be the means of some one being more careful and using greater efforts in preventing the spread of diphtheria."

In reporting an outbreak of diphtheria, Dr. S. J. Smith, health officer of Fair Grove township, Tuscola county, writes:—

> "It came from Saginaw, as follows: The mother of the patient living, and nursing diphtheria patients in Saginaw, took the daughter there on a visit and into a badly infected house, hence the source of the contagium." "The mother of the dead children came from a sick room (diphtheria) in Saginaw early in the case, and remained till the children died, and then went away in the night with clothing unchanged, took the train at Gilford a few miles away, to the exposure of many of course."

Dr. M. W. Danforth, health officer Cascade township, Kent county, reported relative to an outbreak of diphtheria in that township, as follows:—

> "The parents with the child attended church (two weeks before the outbreak) at Grand Rapids. The church was in an infected district."

The following petition, signed by 34 citizens of the village of Coopersville, Ottawa county, was received at this office:—

To the Honorable Board of Health of the State of Michigan:

We the undersigned citizens of the village of Coopersville, Ottawa county Mich., hereby petition your honorable Board to have something done at once in regard to the reckless treatment of the cases of diphtheria at present in this village. The local Board of Health and the Health Officer are apparently as indifferent as can be and pay no attention to any requests made to have families quarantined and prevent the spread of this dread disease. Two deaths have occurred and no quarantine regulations of any kind enforced.

"We earnestly pray you to hurry the matter as a large number are daily being exposed and several new cases started."

Acting on the complaint made in this petition, the Secretary of this Board wrote to F. D. Smith, M. D., health officer of the village of Coopersville, as follows:—

"Your notice of outbreak of diphtheria reached this office, but not until a petition had come, signed by many citizens of your village setting forth that two deaths have occurred, and 'several new cases' and that the local health officer and local board of health are apparently indifferent; and this seems to be borne out by your report, wherein it appears that the first case was taken sick June 3, that death occured June 7, but your report to this office was not mailed until June 11. The foregoing is put before you to give you an opportunity to explain, and I am very glad to see on the back of your report your statement that all precautionary measures have been taken, and will spare no pains to suppress the spread of disease."

The measures taken to suppress this outbreak seem to have proved effectual, as no further spread of the disease was reported from Coopersville.

Relative to an outbreak of diphtheria, which resulted in seven cases and three deaths, Dr. F. R. Haynes, health officer of Trowbridge, Allegan county, wrote to this office:—

"No report made to board of health." "The first family I knew nothing about till the 3 were dead and buried. The parents of the second helped to take care of the children of the first."

Jasper N. Clark, health officer of Victory township, Mason county, in reporting an outbreak of diphtheria, wrote:—

"I did not know that any one was sick until I heard that the girl was dead. The next morning I saw one of our justices of the peace, who lived close to the house where the sickness was, and he said everything was being done he thought all right."

From Saginaw, where there were reported to have occurred 147 cases of sickness and 31 deaths from diphtheria during the year, the health officer, N. D. Lee, M. D., wrote to the Secretary of this Board as follows:—

"I am discouraged in trying to eradicate this epidemic of diphtheria * * * *. They have diphtheria in a malignant form in Thomas, Saginaw and Kochville, towns in which there is no effort being made to control it, and East Saginaw is not much better; and when I get rid of it some one or more catch it, or bring it into our city again. I have no board of health to assist me in any form whatever. When this consolidation question is settled I have a faint hope that things in general will be better."

Dr. W. C. Gates, health officer of Rockland township, Ontonagon county, reported to this office as follows:—

"Was called to Trout creek, Interior township, today, about 60 miles from here by rail, to attend diphtheria. I had only hour and half there before train. I find diphtheria has been there some time; that a child had it, recovered, its sister was taken sick and died. A doctor from Ewen (hearsay only) gave a certificate of death (tonsillitis). Corpse shipped in rough box to Marquette (via D. S. S. & A. Railway); taken out and put in casket, shipped to Montague, Muskegon county; open funeral, etc.

"At Trout Creek men are scattered around in little log huts, are not quarantined, people that are recovering go around in post-office, stations and store, and on trains, exposing everybody. I was told that the supervisor had been notified twice; but had taken no steps in regard to the matter. I telegraphed him a notice, and will notify the prosecuting attorney for the county tomorrow. I do not know what more to do, so wrote you in regard to it. All that I say is as told me by people there. I find severe type of diphtheria at the place and saw exposed people board the D. S. S. & A. train. I notified the conductor to inform the R. R. Co."

On receipt of the above letter from Dr. Gates, the usual official letter relative to diphtheria was sent to Dr. H. G. Tideman, health officer of Interior township, and the Secretary wrote to Dr. J. D. Meinhardi, health officer of the village of Montague, as follows:—

"Information has reached this office that the body of a child, dead from alleged 'tonsillitis,' but which really was diphtheria, was shipped recently in a rough box, from a point called 'Trout Creek,' in Interior township, Ontonagon county, to Marquette. At Marquette the body was moved from the rough box and placed in a casket, and shipped to Montague, and a public funeral held at Montague. It seems that no precautions were taken to protect the public.

"I am unable to give the name of the child who died of diphtheria, or of any of the people who assisted at the funeral at Montague.

"I give you this information that in case you have an outbreak of diphtheria in your jurisdiction soon, it may be of assistance in locating the source of contagium, and that you may perhaps be able to confine the disease to the persons who attended the funeral. I shall be glad to hear from you as to whether you can learn the names of the family, in Montague, who received the body of the child dead of diphtheria; also any other facts relative thereto."

CONTAGIUM SUPPOSED TO HAVE BEEN CARRIED IN RAGS AND CLOTHING.

James R. Borland, health officer, Juniata township, Tuscola county, giving the source of contagium in an outbreak of diphtheria which occurred in that township, says:—

"By wearing clothing brought from Saginaw, belonging to and worn by a child who had died of diphtheria."

Dr. W. A. Burdick, health officer of Comstock township, Kalamazoo county, reports, in regard to the source of contagium in an outbreak of diphtheria in that township:—

"Supposed to have been rags from the wagon of a peddler who remained one day with family, as little boy played around wagon."

Dr. F. W. Graham, health officer of the city of Ludington, described the source of contagium in an outbreak of diphtheria in that city as follows:—

"Regarding the first and second cases taken, and afterward proved fatal, the first one, a female aged twenty, robust and in best of health, had been visiting friends in Chicago, Milwaukee and Manistee, and came here visiting. Had been here twelve days when first taken, and lived eleven days. The other, female aged six years, taken two days after first one, and lived five days. I concluded that the cause was from stored rags across the street, and took measures to have them removed. Was in a healthy portion of the city, sewer connection, people clean, and in good society. There have been no other cases in that part of the city since the rags were removed and building fumigated."

PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA.

In Table 6 and accompanying diagram, in the compiling of which 439 outbreaks* are considered, some of the results of the efforts to restrict diphtheria are shown.

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* Whenever a break of sixty days or more has occurred in the progress of diphtheria it has hitherto (in this article) been uniformly regarded as two different outbreaks, but in estimating outbreaks for this table, in those cases in which the second appearance of the disease originated from the first, the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the year; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take complete outbreaks even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

In studying this table it should be borne in mind that the outbreaks considered in the third, fourth, fifth and sixth double-columns are *not* included in the seventh and eighth columns, and that the third, fourth and seventh *are* included in the ninth column. This ninth column is compiled on the same principle as the fourth column in the tables for diphtheria found on pages 212 and 235 of the Reports of this Office for the years 1886 and 1887 respectively. The five double-columns from the third to the seventh inclusive, in Table 6 have been worked out for the third time in the present compilation. The object of this is to determine, if possible, the efficacy of either isolation or of disinfection when employed alone for the restriction of diphtheria. It is believed that by continuing this classification for a series of years, data will be accumulated which may yield important information as to the relative value of isolation and disinfection.

In the 439 outbreaks in table 6 there were 2,713 cases and 619 deaths, an average of 6.18 cases and 1.41 deaths per outbreak. In the 291 outbreaks in which isolation or disinfection or both were not mentioned or the statements were doubtful, there were 1,649 cases and 401 deaths, an average of 5.67 cases and 1.38 deaths per outbreak. In the 22 outbreaks in which isolation was neglected and disinfection was enforced or doubtful there were 114 cases and 44 deaths, an average of 5.18 cases and 2.00 deaths per outbreak. In the 26 outbreaks in which disinfection was neglected and isolation was enforced or doubtful there were 60 cases and 8 deaths, an average of 2.31 cases and 0.31 of one death per outbreak. In the 46 outbreaks in which isolation was enforced and disinfection neglected or doubtful there were 119 cases and 23 deaths, an average of 2.59 cases and 0.50 deaths per outbreak. In the 10 outbreaks in which disinfection was enforced and isolation neglected or doubtful there were 41 cases and 17 deaths, an average of 4.10 cases and 1.70 deaths per outbreak. In the 71 outbreaks in which isolation and disinfection were both neglected we have 902 cases and 169 deaths, an average of 12.70 cases and 2.38 deaths per outbreak. In the 46 outbreaks in which isolation and disinfection were both enforced there were 70 cases and 15 deaths, an average of 1.52 cases and 0.33 deaths per outbreak.

In the ninth column (formed by combining the third, fourth and seventh columns to compare with the fourth column in like tables for diphtheria found in the Reports from this Office for the years 1886–7) there are 127 outbreaks with 1,076 cases and 221 deaths, an average of 8.47 cases and 1.74 deaths per outbreak.

Mr. Frank Storrs, clerk of the township of Laketon, Muskegon county, reported as follows relative to the source of contagium in an outbreak of diphtheria:—

"The diphtheria was brought to Laketon by a child that came here from Muskegon, and had been living in a house adjoining one where they had it there. The girl did not have it until others had taken it; but brought it in her clothing."

The following are quotations from the reports of other health officers relative to the source of contagium in outbreaks of diphtheria:—

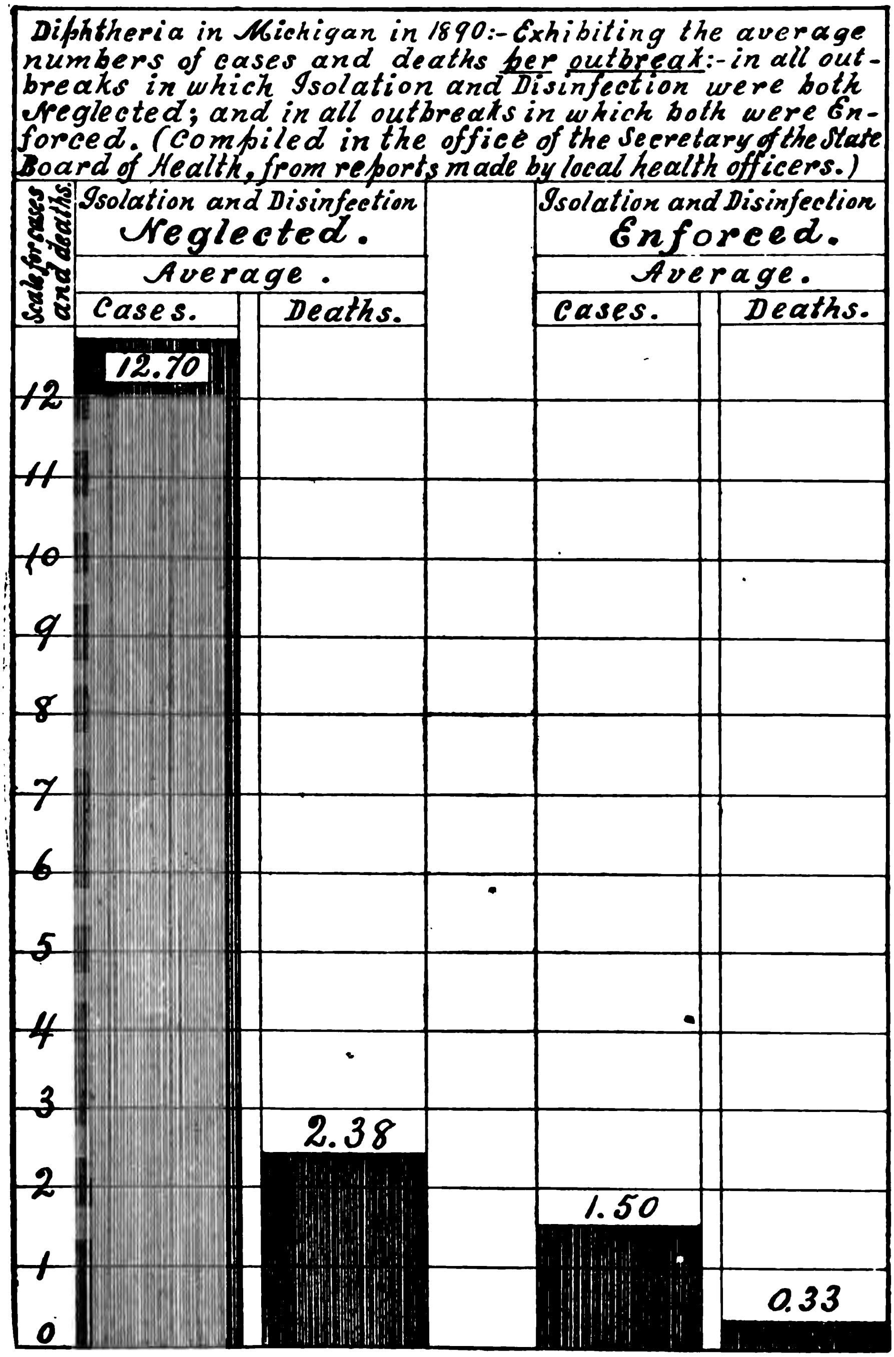
"Supposed to have been carried in clothing by the father of child." "Supposed that the disease came from Jackson county, in a trunk of clothing." "Diphtheria supposed to have been carried in a bundle of newspapers sent from Elkhart, Ind." "Communicated from Ohio by clothing." "Source of contagium, from female tramp carrying two large bundles of exceptionally filthy clothing." "Developed from old clothes carrying germs."

TABLE 6.—*Diphtheria in Michigan in 1890: Exhibiting the Average Numbers of Cases and Deaths per Outbreak:—(1) in all the 439 outbreaks reported; (2) in the 291 outbreaks in which it is doubtful whether or not Disinfection or Isolation was enforced; (3) in the 22 outbreaks in which Isolation was neglected and Disinfection was enforced or doubtful: (4) in the 26 outbreaks in which Disinfection was neglected and Isolation was enforced or doubtful; (5) in the 46 outbreaks in which Isolation was Enforced and Disinfection was neglected or doubtful; (6) in the 10 outbreaks in which Disinfection was enforced and Isolation was neglected or doubtful; (7) in the 71 outbreaks in which both Isolation and Disinfection were neglected; (8) in the 46 outbreaks in which both Isolation and Disinfection were enforced; and (9) in the 127 outbreaks in which Isolation or Disinfection or both were neglected.*

	(1) All Outbreaks. (439 Outbreaks.*)		(2) Isolation or Disinfection or both not mentioned, or statements doubtful. (291 Outbreaks.)		(3) Isolation Neglected, Disinfection enforced or doubtful. (22 Outbreaks.)		(4) Disinfection Neglected, Isolation enforced or doubtful. (26 Outbreaks.)		(5) Isolat'n enforced, Disinfection neglected or doubtful. (46 Outbreaks.)		(6) Disinfection enforced, Isolation neglected or doubtful. (10 Outbreaks.)		(7) Isolation and Disinfection both neglected. (71 Outbreaks.)		(8) Isolation and Disinfection both enforced. (46 Outbreaks.)		(9) Isolation or Disinfection or both neglected. (127 Outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals	2,713	619	1,649	401	114	44	60	8	119	23	41	17	902	169	70	15	1,076	221
Averages	6.18	1.41	5.67	1.38	5.18	2.00	2.31	0.31	2.59	0.50	4.10	1.70	12.70	2.38	1.52	0.33	8.47	1.74

* These do not include the cases in Detroit and Grand Rapids, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all the time. See footnote, on page 170.

ISOLATION AND DISINFECTION RESTRICTED DIPHTHERIA IN 1890.



Diphtheria in Michigan in 1890:-Exhibiting the average numbers of cases and deaths per outbreak:-in all outbreaks in which Isolation and Disinfection were both Neglected; and in all outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)

Although the data contained in the third, fourth, fifth and sixth columns in Table 6 seem to indicate that isolation, as compared with disinfection, where only one or the other is enforced, produced the better result in limiting the number of cases in an outbreak, it should not be concluded that because isolation thus seems to be the most potent factor in limiting the number of *cases* in an outbreak, it will have the same effect in limiting the *number of outbreaks*. If disinfection be neglected, the reverse may be realized in the same or in some future year, for the reason that the diphtheria germ retains its vitality for months and even years, and a new outbreak may occur whenever a susceptible person comes in contact with the material which was not disinfected. If we would limit this terrible disease it is necessary, therefore, that disinfection as well as isolation be rigidly enforced.

Table 6 also seems to indicate that if no restrictive measures had been taken in the 439 outbreaks, and the average for all outbreaks had been 12.70 cases and 2.38 deaths per outbreak, as in the 71 outbreaks in which no restriction was practiced, there would have been 5,575 cases and 1,045 deaths. Deducting from these the cases, 2,713, and the deaths, 619, which actually occurred (not including those in Grand Rapids and Detroit), there is indicated a saving of 2,862 cases and 426 lives from diphtheria during the year 1890, by isolation and disinfection. Had the measures of restriction been enforced in each of the 439 outbreaks, as it was in each of the 46 outbreaks in which they *were* enforced, the number of cases would have been only 667, and the number of deaths 145. Deducting these from the number of cases (2,713) and deaths (619), that *did* occur in the 439 outbreaks, there is indicated as having occurred 2,046 cases and 474 deaths from diphtheria in 1890, which could, and should, have been prevented by thorough isolation and disinfection in all outbreaks.

To the householders, physicians, health officers and local boards of health who failed to conscientiously and vigorously enforce these restrictive measures, these 2,046 cases and 474 deaths, which might have been saved, must awaken keen regret, and must plead eloquently for increased care and diligence in the future; while to those who enforced isolation and disinfection the 2,862 cases and 426 lives which were thus saved, are great cause for gratulation. This view is strengthened by reference to table 7, from which it may be seen that during the five years, 1886–90, there is indicated the prevention of 15,297 cases and 2,763 deaths from diphtheria alone by isolation and disinfection.*

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*Of course the number of cases and deaths here indicated as prevented are too small; because, if the outbreaks had been entirely unrestricted, many, perhaps all, of them would have spread into other jurisdictions, and from these into still others, thus causing many more outbreaks, (whenever a disease spreads across the line into another jurisdiction it must then be considered as a new "outbreak,") and these, being unrestricted, would have caused many more cases and deaths; so that there were probably prevented many more cases, and many more lives were saved by isolation and disinfection than the numbers here given.

RESTRICTION OF DIPHTHERIA IN MICHIGAN.

TABLE 7.—*Exhibiting for the five Years, and for each of the five Years, 1886–90, the Number of reported Outbreaks, Cases and Deaths; also, for this five year Period, the average Number of Cases and Deaths per Outbreak in all Outbreaks; in those Outbreaks in which Isolation or Disinfection was Doubtful; in which Isolation or Disinfection, or both, were Neglected; in which both Isolation and Disinfection were Neglected; in which both Isolation and Disinfection were Enforced; and also the Numbers of Cases and Deaths Indicated to have been prevented by Isolation and Disinfection.*

Years.	Indicated Saving of Cases and Lives by Isolation and Disinfection.*		All Outbreaks.†			Isolation or Disinfection, or both, not Mentioned, or Statements Doubtful.			Isolation or Disinfection, or both, Neglected.			Isolation and Disinfection, both Neglected.			Isolation and Disinfection both Enforced.		
	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.
1886	4,374	833	461	3,085	656	243	1,103	250	102	1,650	329	‡	‡	‡	116	332	77
1887	2,371	518	398	2,321	561	202	732	190	118	1,391	320	60	822	195	78	198	51
1888	§ 3,292	§ 416	311	1,529	324	199	810	189	60	674	117	34	527	81	58	101	31
1889	§ 2,398	570	376	1,986	418	254	1,314	280	62	576	122	41	478	108	63	98	14
1890	§ 2,862	426	439	2,713	619	291	1,649	401	127	1,076	221	71	902	169	46	70	15
Totals	15,297	2,763	1,985	11,634	2,578	1,189	5,608	1,310	469	5,367	1,109	206	2,729	553	361	799	188
Averages	3,059	553															
Av. cases and deaths per outbreak				5.86	1.30		4.72	1.10		11.44	2.36		‖ 13.25	‖ 2.68		2.21	0.52

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† Outbreaks in Detroit and Grand Rapids not included.

‡ This column not compiled for the year 1886.

‖ Average for the four years 1887-90.

* For the years 1886 and 1887, the number of cases and deaths in this double column are found by multiplying "all outbreaks" for the year by the average number of cases or deaths per outbreak in the "Isolation or Disinfection or both Neglected" column, for that year, and deducting from the result thus obtained, the cases or deaths, as the case may be, which *did* occur in that year.

§ For the years 1888-90 these results are obtained in the same manner as stated in the (*) footnote above, except that "All Outbreaks" for each year are multiplied by the average number of cases or deaths per outbreak in those outbreaks in which "Isolation and Disinfection both were Neglected."

LIVES AND MONEY SAVED IN MICHIGAN IN 1890 BY RESTRICTING DIPHTHERIA.

As shown in Table 6, on page 170, in the 46 outbreaks of diphtheria where both isolation and disinfection were enforced, there occurred, on an average 1.52 cases and 0.33 of one death per outbreak, whereas the average per outbreak in the 71 outbreaks in which isolation and disinfection were neglected, was 12.70 cases and 2.38 deaths per outbreak; there was thus a saving of 11.18 cases and 2.05 deaths effected in each of the 46 outbreaks in which the preventive measures were enforced, or in all 514 cases and 94 deaths. Estimating the average cost in each case of sickness, for medical and other attendance, etc., at twenty dollars, the funeral expenses attending each death at forty dollars, and the money value of each life saved at five hundred dollars, these 514 cases and 94 deaths prevented, represent values saved to the State amounting to $61,040, due to the enforcement of preventive and restrictive measures in these 46 outbreaks alone.

In the above-mentioned table, 6, it is also shown that in the 291 outbreaks in regard to which isolation and disinfection were not mentioned or the statements made were doubtful, the average per outbreak was 5.67 cases and 1.38 deaths, a difference between this class of outbreaks and that in which isolation and disinfection were known to be neglected, of 7.03 cases and 1 death per outbreak. This decrease of sickness and mortality in the former class of outbreaks from that of the latter class, is probably due to partial execution of preventive and restrictive measures. It is therefore reasonable to credit these agencies with this decrease, which, for the 291 outbreaks is 2,046 cases and 291 deaths, which, at the before-mentioned valuations, represents a money value of $198,060. This amount, plus the $61,040 gain, shown in the preceding paragraph, makes a saving to the State, with reference to this one disease, through measures recommended by the State Board of Health, adopted by the local health officials, and supported by the people, of $259,100 during the year 1890.

This apparent saving of over a quarter of a million of dollars to the people of Michigan in a single year by restrictive measures, in a single disease, is very gratifying. There is, however, another view of the case. In the first double column of Table 7 is given, relative to diphtheria, in 1890, an indicated saving of 2,862 cases of sickness and 426 deaths. This estimated saving is based on the hypothesis that if no preventive measures had been adopted, all the 439 outbreaks reported would have resulted as did those 71 outbreaks which are known to have been neglected, that is, in 12.70 cases and 2.38 deaths per outbreak, as shown in Table 6, and, computed as described in (§) foot-note to Table 7, would have culminated in 5,575 cases and 1,045 deaths, which, minus the cases and deaths which actually occurred, represent the saving due to the employment of complete or partial restrictive measures; and, based on the before-mentioned valuations, the 2,862 cases and 426 deaths thus indicated as saved, represent a money value of $287,280.

Still another view of this subject, obtained by evidence not quite so direct and certain, yet sufficiently reasonable and reliable to make it worth while to examine it, is as follows:

In Michigan the sickness-statistics are collected by the State Board of Health, the statistics of deaths are collected and published by the Secretary of State. These statistics, collected by different departments of the State government, are, as a rule, not put on record, in the localities, by the same persons. Not all cases of sickness, or even all the deaths, are reported by either set of officials, yet it is known that both sets of statistics are very valuable. It is, therefore, interesting and instructive to compare them. In the following paragraphs a study is made of the statistics from these two sources, relating to diphtheria. It seems to show:

SOME MONEY LOSSES WHICH SHOULD HAVE BEEN PREVENTED.

The number of deaths from diphtheria reported to the Secretary of State during the year 1890, was 1,266. Assuming that the deaths so reported, bear the same ratio to cases (25 per cent) as exists in outbreaks of the disease reported to the State Board of Health during the same year, as shown in Table 2 on page 155, there occurred 5,064 cases of sickness from diphtheria in Michigan during the year 1890. Estimating the average cost of each case, for medical and other attendance, etc., at the low figure of twenty dollars per case, the money loss to the people of the State, caused by these 5,064 cases of diphtheria, was $101,280; if the funerals cost on the average, forty dollars each, the 1,266 funerals cost $50,640 dollars; and the 1,266 lives lost, if the money value of each life was $500, shows a further loss to the State, of $633,000 making a total of $784,920.

Calculated on the basis of the average number of cases (9.5) per outbreak, in the 442 outbreaks reported to the State Board of Health in 1890, the 5,064 cases mentioned in the preceding paragraph represent 533 outbreaks as having occurred in the State during the year. Had the preventive and restrictive measures recommended by the State Board of Health, been enforced in all these 533 outbreaks, with results similar to those obtained in the 46 outbreaks in which they were enforced (1.52 cases and .33 of one death per outbreak) shown in column 8 of Table 6 on page 170, there would have occurred only 810 cases of this disease in the State, or 4,254 cases less than actually did occur; and a consequent saving in sickness expenses (at $20 each) of $85,080 would have been effected; the number of deaths would have been reduced from 1,266 to 176, a decrease of 1,090, which would have saved the expenses attending 1,090 funerals (at $40 each), $43,600; and 1,090 lives worth (at $500 each) $545,000. It thus seems evident, that during the year, the State sustained losses from diphtheria alone, amounting to $673,680, which might and should have been obviated. But had all the 533 outbreaks of diphtheria been entirely neglected, there is good reason to believe that there would have occurred in the State, according to the evidence in the tables, 12.70 cases and 2.38 deaths to an outbreak,— a total of 6,769 cases and 1,269 deaths, which would have occasioned a money loss of $820,640.

But whether we conclude that this particular saving, from this disease in 1890, was over a quarter of a million, or over half a million of dollars, enough is known to make it certain that the health measures which have been inaugurated in Michigan, are of very great importance, in a financial as well as humanitarian way,—of much greater importance than any of the most sanguine supporters of the measures have claimed that they would be.

PERIOD OF INCUBATION, IN DIPHTHERIA.

TABLE 8.—*Exhibiting the reported Period of Incubation, stated in days, in seventy-eight cases of Diphtheria. Compiled from reports of health officers in Michigan, for the year 1890.*

Incubation period—Days	1	2	3	4	5	6	7	8	10	11	12	14	20	21	28
Cases in each period	1	*13	3	†10	2	‡6	§13	2	¶7	2	‖8	**8	1	1	1

* In 3 of these cases it was reported as *about* two days.
† In 2 of these cases it was reported as *about* four days.
‡ In 5 of these cases it was reported as *about* six days.
§ In 5 of these cases it was reported as *about* seven days.
¶ In 1 of these cases it was reported as *about* ten days.
‖ In 5 of these cases it was reported as *about* twelve days.
**In 2 of these cases it was reported as *about* fourteen days.

The average period of incubation of diphtheria in the seventy-eight cases is 7.7 days.

TABLE 9.—*Exhibiting, relative to Diphtheria in Eleven Instances in Michigan in 1890, the Reported Period of Incubation, within certain Limits, stated in Days: also the Means, the Average of which may Represent the Average Period of Incubation.*

Days (In three Instances.)	Means.	Days (In two Instances.)	Means.	Days (In two Instances.)	Means.	Days (In two Instances.)	Means.	Days (In two Instances.)	Means.
2 to 8	5	4 to 6	5	5 to 6	5.5	5 to 10	7.5	8 to 10	9
3 to 6	4.5	4 to 10	7	5 to 8	6.5	7 to 10	8.5	12 to 20	16
3 to 8	5.5								

The average of all the means, for the eleven instances, is 7.3 days.

HOW LONG WILL THE GERM OF DIPHTHERIA RETAIN ITS VITALITY?

The following are a few extracts from letters and reports, received from health officers of the State, which bear on this question:—

1. "Source of contagium, handling clothes belonging to child who had diphtheria a year before."
2. "Living in home where once a family had diphtheria a year ago."
3. "Diphtheria had been in the house three years previous, and the house was not disinfected at the time."

CONTAGIUM OF DIPHTHERIA SUPPOSED TO HAVE BEEN CARRIED BY ANIMALS.

H. E. Lannsburg, M. D., health officer of Berlin township, St. Clair county, wrote to this office relative to the source of contagium in an outbreak of diphtheria, as follows:—

> "The diphtheria is supposed to have been first contracted from cats."

Relative to the same outbreak, D. Peterson, M. D., health officer of Capac village, wrote:—

> "Mr. Ives informed me that the first child taken sick was very fond of a cat that died from some throat trouble. This the attending physician supposed to be the source of contagium."

Dr. W. C. Gates, of Rockland, Ontonagon county, wrote to this office, relative to diphtheria, as follows:—

"Some time ago I sent you a final report of an outbreak of diphtheria at Trout Creek. Since then I have good reasons to think that the outbreak originated from a box car, as two boys who played in the empty car were the first to come down with it.

"After I sent in my final report it broke out again. I could do nothing with the people there as they would not obey my orders, so I have resigned my position as health officer.

"In one case there were a dog and a cat in the family. I ordered both killed as both were sick. A neighbor woman found it out and begged for the cat, which the family let her have. She took the cat five miles south of there to her home. Two days after her baby, who played with the sick cat, came down with diphtheria, and died. A similar history is connected with the dog, and the people still insist that the animals did not have or carry the disease."

HINDRANCES TO PUBLIC-HEALTH WORK.

The following correspondence shows a regrettable source of hindrance to public-health work which is occasionally manifested.

Dr. N. D. Lee, M. D., health officer of the city of Saginaw, West Side, reporting in regard to diphtheria in his jurisdiction, wrote:—

"There was prevailing at this time in the 15th ward of this city, quite an epidemic of sore throat or tonsillitis, mostly very mild with no false membrane, not sick enough in most cases to call a physician Probably about 15 to 20 families, at first, had sore throat. The people of this ward are mostly laboring men and women, in the saw-mills and factories, and mostly from Canada and Europe. The ward generally is in a very unsanitary condition as to water, sewerage and filth. They have ditches along the streets and every kind of filth is thrown into them. The people rent their houses, and are most of them very poor. All go to church and Sunday school and church-day-school, without paying any attention to contagion. Nearly every case of diphtheria belonged to that ward. We had but few sporadic cases, in any other part of the town, which did not spread. I visited many of these cases of sore throat with other physicians, for I was apprehensive that it was diphtheria in a mild form, and cautioned the people to keep away from it; but the more I cautioned them the more they ran to see about it, until finally, on July 26, 1890, we had a case, Michael Hurley, the first case with the characteristic false membrane deposited on the tonsils, which was managed carefully and well; but diphtheria very rapidly spread all over the ward where sore throat was prevailing, and there was a constant interchange of visits with these people and the same kind of people on the east side of the river, where the disease was prevailing at the time. We have diphtheria and scarlet fever on every side of us, with a constant coming to town with these contagions. We have no board of health, only the common council, since consolidation, and I have no help but a policeman, called assistant health officer. * * * * I cannot do all of this work for nothing. I have had to work constantly and furnish a horse and buggy every day and night, Sundays not excepted. for $300 a year. I shall not do it any more after this winter. The common council cannot give me any more pay under the statute, even if they want to do so. The health laws need a general overhauling. They are as defective and full of holes as a skimmer. You can hardly prosecute a case in court successfully if defended. In large towns like this health officers must have more pay if you want good work done and good physicians to fill the place of health officer as it ought to be done."

Jan. 15, 1891, Dr. Wm. N. Reed, health officer of Calvin township, Cass county, wrote to this office as follows:—

"I have not been able to make out a report sooner as I could not spare the time. The town board of health here are about the same as no board at all, for they do not prevent the spread of contagium, and will not pay me for my services; so I have but little encouragement to work. Here is a bill I presented Dec. 12, 1890, and they want to cut it to $16. They will not pay anything on it because I refuse to accept their proposition. What am I to do with the matter? I have made some investigation and it seems that I can get no satisfactory instruction regarding it. If the contract between the local board and health officer is only a sham and cannot be collected by law, what is the health officer to do when dealing with a local board that refuses to pay him for his services?

"Our contract was that they pay me $2 per day for my services. Look this bill over carefully, and see if it is collectable by law and state the same in your reply, please."

In reply to the above-mentioned letter, the Secretary of this Board wrote to Dr. Reed as follows:—

"Please accept thanks for annual report and letter of Jan. 15. In reply to your question about your bill for services as health officer, I refer you to paragraph on page 18 of 'The Work of Health Officers and of Local Boards of Health in Michigan,' which I have marked and send by this day's mail.

"I herewith return the bill as requested."

THE CONTAGIUM OF DIPHTHERIA SUPPOSED TO HAVE BEEN COMMUNICATED BY THE USE OF A LEAD PENCIL.

John Stephens, supervisor and health officer of Rich township, Lapeer county, reporting to this office relative to diphtheria in his jurisdiction, wrote:—

"Case No. 26 in my report of contagious diseases, Hattie Sanford, was not at home when Annie Sanford her sister was sick (Case No. 14 of my report). After they were all cleaned up and disinfected, Hattie came home and found a piece of a lead pencil which had been overlooked, and she of course took charge of it. The nurse says that Annie used the pencil a good deal while sick, by writing on pieces of paper, and no doubt put it in her mouth.

MEASURES TAKEN TO RESTRICT DIPHTHERIA, AND THE RESULTS.

The following are a few extracts from the reports of health officers relative to measures taken to restrict diphtheria:—

Dr. A. T. Parrish, health officer of Byron village, Shiawassee county, wrote relative to an outbreak of diphtheria in his jurisdiction:—

"You probably notice a break in my reports since February 2. On February 6, I was taken with diphtheria, and, as I believed I had not exposed anyone, I immediately went to the farm house where I then had two cases under my care. By so doing we have confined the disease to that house; but during the three weeks, I had six cases including my own."

Dr. Lafayette Woodruff, health officer of Troy township, Oakland county, sends the following report from the attending physician, Dr. C. M. Raynale, in an outbreak of diphtheria:—

"In reporting the case of diphtheria in the person of the child George Most, in your jurisdiction, will say, was called December 30, 1889. (The child had then been sick two or three days.) Made my last visit January 4, 1890. Child recovered. There were two children in family, one about two months old. By being very thorough with treatment and disinfectants, having the house and clothing thoroughly disinfected, further spread of the disease was arrested. Immediately across the street Mr. Most's brother resides, having a large family of children. Through precautions taken, no cases occurred in the brother's family."

DIPHTHERIA IN TRUFANT.

The following letter signed by fifteen citizens of Trufant, Maple Valley township, Montcalm county, was received by Hon. John Avery, M. D., President of this Board, and was forwarded by him to the Secretary:—

"We, the undersigned citizens of Trufant, feel ourselves unsafe and insecure from the present conditions in the management of diphtheria in our village. The family that has been so sorely afflicted, received their liberty yesterday. Since that time another member of the family has died from the disease. We earnestly solicit your presence and investigation of said conditions."

In response to the request made in the above letter, Dr. Avery visited Trufant, and, after investigation of the conditions existing there, made the following report to this office:—

"I enclose letter from citizens of Trufant, Montcalm county, in regard to family afflicted with diphtheria. * * * In answer to the enclosed letter, I went yesterday to Trufant. I found the family in most miserable and unsanitary surroundings. The house, while sufficiently roomy, is without basement or wall sits on the ground with a small unventilated excavation for storing vegetables. On each side of kitchen and dining room is a broad platform, practically on the ground. A chip pile is on east end of kitchen, and wash slops are thrown from north platform. A cistern is covered by south platform. About six weeks ago, two families, one on each side of the Ervay house, had several children sick with sore throats and fever; but the disease was not called diphtheria. About four weeks since the Ervay family came down with diphtheria, since when, three have died, the last one on Saturday night last. No others are sick, and the disease has not yet spread from the Ervays. I advised continuing the quarantine for a week yet, and gave full directions for purifying and disinfecting the house and premises; but really, fire is the only effective disinfectant for such a house."

PAMPHLETS ON RESTRICTION AND PREVENTION OF DIPHTHERIA.

The high appreciation in which the pamphlets on the "Restriction and Prevention" of communicable diseases, issued by the State Board of Health are held, is again demonstrated in 1890 by the many applications made to the Office of the Board for those documents, by local health officers and others throughout the State. The letters and reports containing such applications, of which the following extract is a sample, leave no doubt that the said documents are prized as an efficient aid to local health officers in their efforts to restrict and stamp out dangerous communicable diseases:—

"Please send me pamphlets for the restriction and prevention of diphtheria, in English, German and French languages, about 75 to 100 in each language, and about the same in each language for scarlet fever, except the German language of which I have enough for the present. Please send immediately. I can do a great deal of good with these pamphlets, and I need all the help that I can get, for I do not get much assistance."

DIPHTHERIA IN ALBERT TOWNSHIP, AND WHEATFIELD TOWNSHIP, MONTMORENCY COUNTY, AND CHARLTON TOWNSHIP, OTSEGO COUNTY.

(The first and last are adjoining townships lying on opposite sides of the county line).

On April 25, 1890, a copy of the "Atlanta Tribune," Atlanta, Montmorency county, Mich., issued April 17, 1890, reached the office of the State Board of Health, in which appeared the following item:

"Reported to be over 20 cases of diphtheria in and around Vienna."

Vienna being an unincorporated village in Albert township, Montmorency county, a letter asking for a report, and urging prompt restriction of the alleged diphtheria, was immediately sent to J. T. Dimmick, health officer of Albert township. On May 8, the following reply was received:

"SIR:—This is to inform you that the item in the Atlanta Tribune was false. There has not been a case of diphtheria in or near Vienna. Dr. Warner, of Gaylord said it belonged to la grippe, and was not contagious.

Yours truly,

J. T. DIMMICK, *Health Officer*."

"P. S. Sulphur was burned as a disinfectant."

Just why disinfection was attempted if the disease was *not* communicable remains to be explained. But that there was a fatal throat disease in or near Vienna, that communicated diphtheria in Lapeer county was subsequently proved.

June 4, there was received from C. A. Wisner, M. D., health officer of Marathon township, Lapeer county, a final report of an outbreak of diphtheria in his jurisdiction, and in reply to the question as to "source of contagium and mode of introduction of the disease" he sent two certificates of death, given by F. C. Buchner, M. D., Atlanta, Montmorency county, which certificates were from the coffins of two corpses brought into Lapeer county. The certificates are as follows:—

"OFFICE OF F. C. BUCHNER, PHYSICIAN AND SURGEON,
Atlanta, Mich., March 23, 1890.

"TO WHOM IT MAY CONCERN—This is to certify that Mrs. Dell Putman, of Vienna died of suppurative tonsillitis, and that it is a disease not dangerous to the public health.

FRANK C. BUCHNER, M. D."

"*Atlanta, Michigan, March 23, 1890.*

This is to certify that I was called to see the little girl Flossie Putman, and that it died of spasmodic croup a disease not dangerous to the public health.

FRANK C. BUCHNER, M. D."

In this report Dr. Wisner states that the first case occurred March 31, and, relative to the source of contagium and mode of introduction of the disease, writes:—

"The corpse of Mrs. Dell Putman, also that of her little girl, were brought from Vienna, Montmorency county, on the 24th of March, 1890, to her father's home here. Mary Tibbits, a step-daughter, was present, and helped to open the coffin and attend to the care of the dead until the funeral, which occurred on the 26th of March. I knew nothing of the nature of the disease that had caused their death at this time, but on talking with Mr. Putman on Tuesday, the 25th of March, I became convinced that it was diphtheria, but as I did not know positively, and they had a certificate from Dr. Buchner, stating that the disease which caused their death was not contagious, I could not very well prevent them holding a funeral. I notified them of my suspicions about the case. told the neighbors not to let any of their children go there at all, that the coffins should be closed tight, and not opened the next day at the funeral, which was held at their private residence one mile north of this village. I was censured some for the stand I took, but as subsequent events proved, I think I was right; for on the 31st of March, 1890, just one week from the day she helped open the coffin of Mrs. Dell Putman, she, Mary Tibbits, was taken with diphtheria and was confined to her bed eight days. I inclose to you the certificate which came on each coffin. Please do not destroy them, as they might be wanted, to be referred to, some time. I promptly quarantined this case, which happily was the only one which occurred. I think by warning the neighbors, and the funeral being held privately, we prevented a greater spread of the disease.

C. A. WISNER, M. D., Columbiaville, Mich."

June 7, 1893, a hektographed statement was issued by the Secretary of the State Board of Health, a copy of which was sent to Dr. Buchner, of Atlanta. The statement included the foregoing facts and other statements as follows:—

"That a man capable of practicing medicine, and especially one writing 'M. D.' after his name, could bring himself to sign two such certificates, the same day, relative to two persons in one family, both dead of throat disease, certifying that it is 'a disease not dangerous to the public health,' and thus without precautions permit such dead bodies to go across the State to endanger the lives of innocent persons who rely upon such certificates, is, to say the least, deplorable.

"In this instance, through the care of the health officer, the outbreak of this very dangerous disease was promptly restricted, so that such fearful consequences as occurred from the similar instance at Zanesville, Ohio, in the spring of 1890, were here averted. This is, therefore, one more instance enforcing the importance of requiring, in every case, a permit from the health officer of *the locality into which any dead body* is to be brought, and such notice of the time of the arrival of the corpse as will enable the health officer to take any precautions which he may deem to be necessary.

"Any corpse dead from *any* disease is conclusive proof of the presence of a fatal disease—therefore one which, under certain circumstances, may be dangerous to the public.

"Every local board of health in Michigan is authorized by law to make such a regulation as would provide for such notification, and to enforce, against any person or persons, the penalty for its violation. And as the people of any locality are liable, at any time, to be at the mercy, in this regard, of an ignorant, careless or culpable doctor in some distant place, ordinary prudence would seem to dictate that every local board of health should make and enforce a regulation requiring notice to the local health officer of the arrival of every corpse.

HENRY B. BAKER,
Secretary."

OFFICE OF THE MICHIGAN STATE BOARD OF HEALTH,
Lansing, June 7, 1890.

After the receipt of this statement Dr. Buchner wrote to this office as follows:—

"*Atlanta, Mich., June 14, 1890.*

"*Secretary State Board of Health, Lansing, Mich.:*

"SIR:—Yours of the 7th inst. received and contents noted. I issued the certificates believing the parties to have died of the diseases named, and I can see no reason for changing my opinion. The one case in Lapeer county does not prove that Mrs. Putman and child died of diphtheria. Drs. Parmater, Warner and Fox, of Gaylord, all attended cases in or near Vienna, and none of them pronounced it diphtheria.

"It may be that I may have made a mistake; but the best of physicians are liable to be mistaken, and I do not deem it just that I should be called careless and an ignoramus.

Respectfully,
F. C. BUCHNER, M. D."

A letter dated June 9, from Thomas E. Double, clerk of Albert township, Montmorency county, was received at the office of the Secretary of the State Board of Health, of which the following is a copy:—

"*Vienna, Montmorency County, Mich., June the 9th, 1890.*

"*Secretary of the State Board of Health:*

"SIR:—I wish to call the attention of the State Board of Health to a disease that has raged, and is now raging, in this vicinity. About the 20th of March, there were two deaths occurred in this township, which the attending physician called bronchial tonsillitis, and not a contagious disease. In a short time there were several cases in the families of the persons that were attending on those that had died, some of whom called other physicians who say, too, that the disease is not contagious. But it is the general opinion that it is diphtheria, and is contagious, as everthing goes to show; as, if it once gets into a family, it goes through it, or especially the children. There have been nine deaths caused by it, and more, that are not expected to live with it. There have been no precautions taken to prevent the disease from spreading, as the doctors pronounced it not contagious. It is the general wish to use measures to prevent its spreading, but as I understand it they have no right as long as the physicians pronounce it not a contagious disease. There has been no report made to any of the board of health, or health officer; but every one that has had anything to do with the disease pronounces it diphtheria, and I think it would be proven to be such upon investigation by a competent physician. There are no cases in the township at present, nor have there been any since I have been clerk; but there are several cases in the township of Charlton, Otsego county, the township adjoining this. Please give me some instructions in regard to the matter, and what should be done if it again appears in this township.

"Very respectfully yours,
"THOMAS E. DOUBLE,
"*Clerk of the towdship of Albert.*"

In reply to Mr. Double's letter, the Secretary of this Board wrote to that gentleman as follows:—

"*Lansing, Mich., June 13, 1890.*

"*Thomas E. Double, Clerk of Albert township, Vienna, Mich.:*

"DEAR SIR:—Please accept cordial thanks for your letter of June 9, relative to diphtheria in Charlton township, Otsego county, at the present time, and in your township not long since.

"I think it probable that diphtheria will occur in your township during the next cold season of the year, unless something is done to disinfect the clothing, worn by those who had the disease. On this account it would be well if such clothing, etc., could be disinfected, especially that in houses where deaths have occurred. By this mail I send you a pamphlet on the restriction of diphtheria, in which I have marked sentences bearing on this subject. I also send an account of the spreading of diphtheria to Lapeer county by corpses from your township.

By this mail I send you a package of pamphlets on diphtheria, which I think it would be well if you would distribute to intelligent persons in your township, giving with each pamphlet one of the diagrams showing the utility of isolation and disinfection.

"Any further aid which this Office can give you will be cheerfully rendered.

"In case diphtheria, or any other dangerous disease occurs in your locality, I trust you will give prompt notice to this office.

Very respectfully,
HENRY B. BAKER, *Secretary*."

The following letter, dated June 15, is from Alfred Wilkins, health officer of Charlton township, Otsego county, and has reference to the same outbreak:—

"SIR:—Yours of June 13 to hand. In reply would state that there is no doctor here that will call this disease diphtheria. As soon as I got your letter, I called to Gaylord for an M. D. I asked him if it was diphtheria. He said no, nor yet contagious, he said it was an epidemic in the atmosphere, and was no use to quarantine. He stated to me that he sent a statement of several cases to a Doctor Stone, of Bay City, I think. Dr. Stone replied by letter that the description and treatment were correct. He also stated to me that he should prosecute any one he heard saying it was diphtheria. I told him I got a letter from you asking about it. The doctor's name is Wells H. Warner of Gaylord, Otsego county.

"He said it was a sequel to the grippe and was in several forms. I wish there could be higher medical authority here than what we have. If you could send some one here it would be a blessing, for this is a lingering disease. Where the disease is prevalent, is on the county line between Montmorency and Otsego. Out of about fifty votes in both townships there have been seven deaths, and another in an adjoining township. I saw two shortly before they died. Some breathe like a person troubled with the asthma, others breathed well, some lost their voice a short time before they died, others could speak and breathe with ease, but in all cases their throat, tonsils and palate, were coated with a white, or grey skin, which resembled a blister. Can the local board of health quarantine without a certificate from an M. D. that it is contagious? I did not get the blanks yet, but will probably next mail.

"I feel interested about this disease, for I have two children of my own, and I have helped to bury two children next house to mine. In Montmorency county it took three children, all the man had, and the M. Ds. called it membranous tonsillitis. There have been but two deaths in Charlton township as yet; the others were in Montmorency county. They have not quarantined as yet. I have described to you the best I could, under the circumstances."

In reply, the following letter was sent from this office:—

"*Lansing, Michigan, June 18, 1890.*

"*Albert Wilkins, Health Officer of Charlton Tp., Otsego Co., Vienna, Michigan:*

"DEAR SIR:—Please accept cordial thanks for your letter of June 15. When in the description of the cases you say 'in all cases their throat, tonsils and palate, were coated with a white or grey skin, which resembled a blister,' you describe diphtheria. Influenza (la grippe) has not such characters. Again, when, as you say, the doctors call it 'membranous tonsillitis,' that also is diphtheria. You speak of this disease being especially fatal to children, mentioning the death of five. This is characteristic of diphtheria, and *not* of la grippe, which is seldom fatal to any one, and to children less than to grown people.

"You ask, 'can a local board of health quarantine without a certificate from a doctor?' Certainly. The local board of health must act on its *own* best judgment.

"I send you pamphlets, by this mail, in which I have marked paragraphs bearing on this subject. You will see that the health officer must act on his own judgment, but whenever he 'shall have reason to believe' that diphtheria is present in his jurisdiction, he has certain duties to perform, and the law imposes a fine, and possibly imprisonment, if he does not perform these duties.

"I trust that you will take prompt measures, and do the best you can to restrict the further spread of this dangerous disease. It is certainly a 'disease dangerous to the public health,' and I think you will be safe in assuming that it is diphtheria.

Very respectfully,
HENRY B. BAKER,
Secretary."

The following is from Birney Dutton, clerk of Charlton township, Otsego county:—

"*Vienna, June 12th, 1890.*

"*Secretary State Board of Health, Lansing, Mich.:*

"DEAR SIR:—I wish to make a little inquiry in regard to a certain disease that has been raging in this section, being the most severe in two or three townships near the boundary between them. It has been very fatal here. There have been nine deaths in this immediate vicinity, and others very sick with the disease. The doctors pronounce it membraneous tonsillitis, and say it is not contagious, and will do no good to quarantine. What should you advise? If it should break out again here, have we any right to quarantine if the doctors pronounce a disease not contagious? We are fearful of a fresh attack of the disease, as it has died down once or twice before, and then broke out again."

Yours respectfully,
BIRNEY DUTTON,
Clerk of Charlton township, Otsego Co., Mich."

The following letter was sent in reply to Mr. Dutton's letter:—

"*Lansing, Mich., June 16, 1890.*

"*Birney Dutton, Clerk of Charlton Tp., Vienna, Mich.:*

"DEAR SIR:—Please accept thanks for your letter of June 12.

"I think the disease which you refer to, is undoubtedly diphtheria, and unless proper precautions are taken, such as the disinfection of the premises, clothing, etc., where cases of the disease have occurred, that the chances are good for another outbreak of the same disease at some future time, probably as soon as cold weather approaches again.

"Evidence which goes to prove that the disease, which was present in and around Vienna during the past few months, was diphtheria, is the fact that two corpses were shipped from Vienna, at the same time, to Metamora township, Lapeer county, Mich., and a young lady who assisted in opening the coffins upon their arrival, was stricken with diphtheria.

"I wrote to the *health officer* of Charlton township on June 13, relative to diphtheria. I send you, by this mail, blanks for reporting to this office, pamphlets on the restriction of diphtheria, etc.

Very respectfully,
HENRY B. BAKER,
Secretary."

In response to a letter inquiring why sulphur was used, if the disease was not thought to be contagious, J. T. Dimick, health officer of Albert township, wrote:— "I don't know why they used it unless they thought that if it did not do any good it would not do any hurt."

In reply to Mr. Dimick's letter, the following letter was sent to him:

"*Lansing, Mich., June 21, 1890.*

"*J. T. Dimick, Health Officer of Albert Tp., Vienna, Mich.:*

"DEAR SIR:—Please accept cordial thanks for your letter of June 17 relative to reasons for the use of sulphur.

"On page 3 of the pamphlet giving proceedings of this Board at its meeting January, 1888, previously sent to you, you will see the importance of doing just what you suggest was done in this case—the disinfection in suspected cases. You will see that the recommendation is that *all precautions* should be taken the same as in cases of known diphtheria. Pending the investigation by this Board I trust that you will see to it that all houses are thoroughly disinfected, and patients are thoroughly isolated just the same as though the disease was admitted to be diphtheria.

"In accordance with the resolutions passed by your township board, I hope to send some one to your locality in whom your physicians have perfect confidence, and I hope to secure the services of Prof. Vaughan, of the State University. Will you have the kindness to inform me how he will most easily reach your locality to make the investigation? Can he come by way of Gaylord?

Very respectfully,
HENRY B. BAKER,
Secretary."

On receiving Mr. Wilkins' letter of June 15, the following letter of inquiry was sent to Dr. H. Wells Warner:—

"*Lansing, Michigan, June 18, 1890.*

"*H. Wells Warner, M. D., Gaylord, Michigan:*

"DEAR DOCTOR:—Along the line between Otsego and Montmorency counties there is a *fatal* disease which some of the doctors report as 'membranous tonsillitis.' Of course 'membranous tonsillitis' can be nothing more nor less than *diphtheria*, and that is what the disease has been reported to this office to be. A letter from J. T. Dimick, health officer, Albert township, Montmorency county, stated that some time ago you pronounced the disease in his township to 'belong to la grippe and was not contagious.' Now the disease in Albert township is especially fatal to children, and that is *not* true of la grippe. Besides, other physicians have pronounced it to be 'membranous tonsillitis' and *that* is diphtheria.

"I have just received a letter from Alfred Wilkins, health officer of Charlton township, in Otsego county. He mentions your name again with reference to the disease being the 'grippe' in this township; but he says: 'In all cases the throat, tonsils and palate were coated with a white or grey skin which resembled a blister.' That would describe diphtheria, but *not* influenza. Besides, they have had two deaths in Charlton, and influenza does not often cause death, at any age, still less often in children.

"Bodies of two dead from the disease in Vienna, were sent to Lapeer county, and there apparently communicated diphtheria.

"Already more deaths have occurred in this outbreak along the county line than in the average of all outbreaks of *diphtheria in which proper precautions are neglected.*

"I hope you will give this subject a very thorough consideration, and write me on the subject.

Very respectfully,

HENRY B. BAKER,

Secretary."

In reply to the preceding letter, the following was received:

"OFFICE OF H. WELLS WARNER, M. D.,
Gaylord, Mich., June 19, 1890.

"*Henry B. Baker, M. D., Lansing, Mich.:*

"DEAR SIR:—Your favor of recent date was received today and contents carefully noted. In reply, I will give to you all the information, relative to the disease in question, that I have been able to obtain.

"Since the beginning of the new year I have had about one hundred cases of this throat difficulty, alone. It is endemic in character, being worse in some localities than in others. I claim that it is a trouble arising from the effects of la grippe and have observed that it assumes the character or form of congestion, neuralgia or bronchial trouble. Congestion mostly settles in the mastoid cells, producing abscesses of those organs. In many cases there have been membranous patches, upon the tongue and tonsils, usually, and in the nares. There are a great many who have sore throat or congestion of the throat that do not have these membranous patches. Otherwise there is no difference in the complaint. In some cases I find these patches have been in the throat since last March, and those thus affected have continued at their work both in and out of doors without the aid of medicine and have exposed themselves to all sorts of weather with perfect impunity, with no unpleasant sequels following. Several parties, who have been seriously affected with this disease, immediately on improvement resume their accustomed duties, either in or out of doors, and experience no trouble from relapses. On the contrary, in most cases, such a course hastens their recovery. This is *not* true of diphtheria, generally speaking.

"The breath in all cases is sweet and normal, unless there is a presence of catarrhal affection, and then, of course, a catarrhal odor is discernable. In most cases there seems to be a burning sensation of the œsophagus accompanied with nausea and vomiting. The tonsils are of a dark-red color while the mucous membrane very often appears covered with small specks apparently like or resembling blisters. These are not found accompanying a white, furred tongue in all cases. When the tongue is so affected it is thickly furred and remains so for some time. In fact, the furred tongue is still found in every case that has been afflicted with the disease and apparently fully recovered. The membraneous patch is of a pure milky white color and, in all cases, is quite tenacious. In eats into the tissue in some cases, causing hemorrage. In all cases this is serious, and in one case has resulted fatally. In a large number of cases a rash with large blotches has made its appearance. When the rash comes out well the throat affection gives very little trouble, otherwise it is worse. I have two cases, at present, afflicted with this congestion of the mastoid glands that do not have the rash "come out" well. They had serious sickness but are convalescing nicely now. With this rash, as the patient convalesces, the cuticle peels off and has some resemblances like unto scarlet fever. The temperature usually ranges from 101° to 104¼°, the worst cases having the latter; but the average is about 103° F. Many experience no trouble with their stomachs, have a good appetite and ability to retain food well. Such usually have regular bowels and a healthy action of the kidneys. There seems to be no great constitutional depression of the system and, ordinarily, sick patients rally rapidly.

"I visited two cases this morning, having all the symptoms in every convincing respect, both as to the furred tongue and throat inflammation. One had, like a great many other sufferers, a severe cough. The other had no cough and no membranous patch. As I said before, others carry the patches a long time and some are seriously sick and have no patches. This morning, I saw a former patient, who is apparently usually well and going about his work and who still has the patches in his throat, having carried them about for more than five weeks. By the way, he has catarrh quite badly and I notice in such that the patches are more difficult to remove. To show how singularly this disease works I will quote another case. Mrs. Chas. Gocha, Jr., Gaylord, aged about thirty-five years, during a day in the middle of April, did a washing and at night or in the evening felt as well as usual. About bed-time she felt a depression in her throat and later on (about half past ten o'clock), after having experienced some difficulty in breathing, in a short time became so unable to breathe, apparently by a spasmodic action, that she came very near dying—grew black in the face and was only kept alive, until I had been summoned and had arrived, by the most strenuous efforts of her husband, he leading her to the air and blowing air into and through the narrow opening into the lungs. Timpanitic trouble also set in until she bloated so that the diaphram seemed to have lost its power of action. There was no fever but an irregular, fluttering pulse, running one hundred and thirty times per minute. Her tonsils were clean and her palate and throat normal as far as could be seen but her tongue soon became very heavily coated with the la grippe coating. I swabbed her mouth and tonsils as far back as possible with Sulpho Calcine, the urgency of quick relief warranting the use of the fluid in its full strength. Directly she breathed easier, and in just twenty-five minutes, an examination revealed the remarkable presence of a white membranous patch, extending from the tip of her tongue back to the tonsils and palate and also covering the roof of her mouth and the exposed inside surface of the cheeks; its thickness was from one-eighth to one-quarter of an inch. Her breathing continued to grow easier and by the application of the Sulpho Calcine every half-hour with constitutional treatment, the patches had all disappeared by the following day at 3 o'clock P. M. and in four days the inflammation subsided, allowing her to resume work. She has since (several weeks later) had a slight relapse but nothing serious.

"There are quite a number of symptoms that resemble diphtheria, yet there are so very many that are so widely different, that I cannot bring myself to believe it to be that malady. There is not the amount of blood-poisoning as connected with diphtheria. It makes no difference whom it attacks. Young and old are alike subject to its ravages as in la grippe, and its constitutional effects are not the same as those following diphtheria. Very few die in proportion to those afflicted, and it seems to drop down in certain localities sometimes isolated, comparatively, from other settlements. Families that are miles apart in the woods, that have remained closely on their respective places for weeks, have it, thus showing its endemic character. One young homesteader, who had been on his place away back in the woods eleven miles from Vienna, Montmorency county, or rather on the plains, and who had not been away from home or seen any one since last winter, in March, came into Vienna with his throat bundled up and containing those tell-tale patches. Yet he came afoot, did his trading and went home, seeming to care nothing about securing treatment. For the above and other reasons I cannot agree with your diagnosis respecting this disease.

"You mention that there were two bodies shipped from Charlton or Vienna, having died from influenza. From that which I learn, these cases were afflicted with the same trouble that I am trying to describe to you. I also understand that Dr. Wisner claims that one woman in Lapeer contracted diphtheria from those bodies. I am creditably informed by relatives of the woman referred to, that she had the sore throat and had been sick with it for several days before she saw the bodies, and so remained until she became worse and the report was started that she had diphtheria. The news of this destroys the belief that may have been formed, that she had diphtheria, and I hear that *he*, now, has some doubts as to that report being true. At any rate, it is a very grave disease in some cases. I hardly think it is contagious, yet it sometimes looks as though it might be to a certain extent. It looks to me to be an endemic trouble liable to drop any where. I have now been practicing medicine for thirty-nine years, and if this is diphtheria I do not know what diphtheria is. I have treated diphtheria in my time more or less, and I must say that this trouble is different from anything I have ever seen. I have counseled with the different physicians in this county and they all claim that it is not diphtheria. I really do not know what to call it. I had conversation with Dr. Woodruff, of Grayling. He claims that it follows la grippe and does not think it is contagious. Dr. David Stone, of Bay City, by letter to me, expresses himself that it is a form of la grippe caused from congestion of the mastoid cells and is peculiar to this locality. *We* are having it through this county as well as folks in Montmorency county. In close proximity to the meridian line between the above counties, about twenty miles east, is where I have had the largest number of cases. We have a high

and dry country here, with but few swamps, and that it should affect us to such an extent is more than I can account for.
Yours, etc.,

DR. H. WELLS WARNER."

In reply to Dr. Warner's letter the Secretary of this Board wrote to that gentleman as follows:—

"*Lansing, Mich., June 23, 1890.*

"*H. Wells Warner, M. D., Gaylord, Mich.:*

"DEAR SIR:—Please accept cordial thanks for your letter relative to the sickness in Otsego and Montmorency counties, which may be diphtheria. Relative to your statement that there have been one hundred cases under your treatment, will you have the kindness to inform me how many deaths there were out of that number?

"How old were the decedents?

"Were any cases followed by difficulty of swallowing, or regurgitation through the nose of fluids attempted to be swallowed?

"Were there any symptoms of paralysis about the throat or elsewhere?

"Were there any cases which died suddenly of heart failure?

"The outbreak will probably be thoroughly investigated by this Board, and any aid which you can give will be greatly appreciated.

Very respectfully,
HENRY B. BAKER,
Secretary."

No reply was received to this letter.

On receipt of Dr. Warner's letter of June 19, 1890, the Secretary wrote the following:—

Lansing, Mich., June 23, 1890.

"*C. A. Wisner, M. D., Columbiaville, Mich.:*

"DEAR SIR:—Referring to Mary Tibbitts whom you supposed to have contracted diphtheria from the corpse of Mrs. Dell Putman, Wells Warner, M. D., Gaylord, Mich., writes me that he is "informed by relatives of the woman referred to, that she had the sore throat and had been sick with it for several days before she saw the bodies." Referring to you, Dr. Warner says: 'I hear that *he*, now, has some doubts as to the report being true.'

"Will you have the kindness to inform me whether these statements correctly represent the facts as you understand them now.

"Please find enclosed a stamped envelope for reply.

Very respectfully,
HENRY B. BAKER,
Secretary."

Following is Dr. Wisner's reply:—

"*Columbiaville, July 25, 1890.*

"*Henry B. Baker, Lansing, Mich.:*

"DEAR SIR:—Your letter of June 23, containing information from H. Wells Warner, of Gaylord, should have been answered before this, but wishing to investigate the statements therein made I have waited until now to do so.

"1st. That he had been informed by relatives that she (Mary Tibbitts) had been sick with sore throat several days before she saw the dead bodies of Mrs. Putnam and child.

"All the relatives that Mary Tibbitts has, live here in the vicinity of Columbiaville and in Canada. None of them living in this vicinity have been asked for any information that I can hear of, how it is with those that live in Canada I cannot say. She tells me that she has had no throat trouble of any discription for nearly seven years before this attack, also that she was in her usual good health at the time of the arrival of the corpses. All of which I myself know to be true.

"2nd. Dr. Warner says, 'I hear that he now has some doubts as to the reports being true.' There never was the least doubt in my mind as to the nature of the malady. *I know she had diphtheria.*

"Miss Tibbitts tells me she received a letter from Vienna, written by Mr. Putman, about four weeks ago. He stated that since going back nine had died of the terrible disease and that at the time of writing three more were not expected to live. He said the doctors now claimed the disease to be contagious; but that it was not diphtheria. I believe I am right in saying from what I can hear and have seen, that this disease is nothing but genuine diphtheria, and that those physicians at Gaylord and in Montmorency Co. will come to the same conclusion some day.

Yours truly,

C. A. WISNER, M. D.,
Columbiaville, Lapeer Co., Mich."

Thos. E. Double, clerk of the township of Vienna, sent the following to this office:—

"*Vienna, June 17, 1890.*

"*State Board of Health:*

"GENTLEMEN:—At a joint meeting of the boards of health of the several townships of Albert, Wheatfield, Montmorency county, and township of Charlton, Otsego county, Mich., the following resolution was adopted by said board:

"*Resolved*, That this board request the State Board of Health to make a thorough investigation of the disease existing in and around Vienna, as our local physicians claim that it is not diphtheria or a disease dangerous to the public health, and a thorough investigation is deemed necessary to prevent further spread of the disease, and to ascertain the nature of the disease.

"I do solemnly affirm the above to be a true copy of resolution of said board.

THOS. E. DOUBLE, *Clerk.*"

"The anticipation of the several boards and people of this vicinity is that a member of the State Board of Health or a physician appointed by said State Board of Health will come and make a personal investigation as a result of this sincere request.

"Thanking you for past favors we remain sincerely yours,

By order of Board,
THOS. E. DOUBLE, *Clerk.*"

In reply to this letter, the Secretary of this Board wrote to Mr. Double as follows:

"*Lansing, Mich., June 21, 1890.*

"*Thomas E. Double, clerk of Albert township, Vienna, Mich.:*

"DEAR SIR:—Your communication giving resolutions passed by joint meeting of township boards is before me, and will be acted upon by this office as soon as practicable. I wish that whoever goes to make the investigation shall be one in whom the physicians of the locality have perfect confidence, and I hope to be able to secure Professor Victor C. Vaughan, of the Michigan University, to make the investigation, but it will take some time to do this. Meanwhile, pending the investigation, I trust that all these township boards will take most active measures to restrict the spread of the disease, just the same as though it were known to be diphtheria. That action will be in accordance with the resolutions passed by this Board, which were sent to you from this office.

Very respectfully,

HENRY B. BAKER,
Secretary."

The following is copy of the resolutions passed by this Board, referred to in the secretary's letter to Mr. Double:—

IN ALL CASES OF SORE THROAT, PRECAUTIONS SHOULD BE TAKEN.

Resolutions adopted by the Michigan State Board of Health, Jan. 10, 1888.

WHEREAS, It is often difficult to recognize mild cases of diphtheria, or to distinguish such cases from a simple tonsillitis, pharyngitis, or larnyngitis, and

WHEREAS, Such mild cases of diphtheria often communicate a dangerous and fatal form of diphtheria;

Resolved, That it is the duty of physicians and householders in reporting diseases dangerous to the public health, and of local health authorities in their efforts to restrict such diseases, in every case, to give to the public safety the benefit of the doubt, and in localities where diphtheria exists to regard cases of acute sore throat as suspected cases of diphtheria;

Resolved, That suspected cases of dangerous diseases should be reported, and precautionary measures should be taken.

Dr. Vaughan having, at the request of the Secretary of this Board, consented to make the investigation asked for in the resolution of the boards of health of Albert, Wheatland and Charlton townships, made the following report thereof :—

DIPHTHERIA IN MONTMORENCY AND OTSEGO COUNTIES—REPORT OF INVESTIGATION BY PROF. VICTOR C. VAUGHAN.

Ann Arbor, July 7, 1890.

Henry B. Baker, M. D., Sec. State Board of Health:

DEAR SIR:—In compliance with the request of the Board I have visited Vienna, Mich., and have investigated the epidemic which has existed there for some weeks, and I herewith submit to the Board the result of my investigations.

I reached Gaylord early in the morning of July 3. After breakfast I started out to call upon the physicians and learn their opinion of the nature of the disease. I made repeated visits to the office of Dr. Warner, both at this time and after my return from Vienna, but I am sorry to say that I did not have the pleasure of meeting him. Dr. Fox had seen some of the children of Geo. Welch near Vienna once, the patients having been under the care of Dr. Warner, and he (Dr. Fox) unhesitatingly pronounced the disease diphtheria. Dr. Parmater had seen the Herford children once and said that "if the disease was not diphtheria, he did not know what it was."

As this was all the information which I seemed likely to obtain at Gaylord, I proceeded to Vienna. Here I had a conference with Messrs. Dutton, Double and Dimmick, representing the three townships in which the disease has prevailed. From these gentlemen I learned the following facts: The first case was that of the child of Dell Putman, who lives in the village. This is the child which, according to the certificate of Dr. Buchner, died of "spasmodic croup." About one week after the death of this child, her mother, Mrs. Dell Putman, died of "suppurative tonsillitis," according to the statement of the same doctor. After the death of the child and during the illness of the mother, Mrs. Herford, who lives in the village, took the bedding and clothes from the house of Mr. Dell Putman to her own home for the purpose or washing them. The three little children of Mrs. Herford, aged about seven, four and two years, sickened and died. The family of Mr. Wallington was related to Mrs. Herford and visited the children during their illness. Later there were four cases of the disease in the family of Mr. Wallington. A Mrs. Dickman visited at both the Herfords and Wallingtons during the illness of the children, and subsequently there were four cases of the disease at the home of Mrs. Dickman with one death. During the sickness at Mr. Dell Putman's, a girl, by the name of Ella Morris, worked in the family. This girl, after the deaths in the family of Mr. Putman, went to the home of her step-father, Otho Manes, several miles from Vienna. There were subsequently five cases of the disease at the home of Mr. Manes. During all this time Mr. Dell Putman was clerking in the store of Mr. Putnam, the residence and store of Mr. Putnam being in the same building, which, by the way, is only a few yards from the house of Mr. Dell Putman. There were three cases in the family of Mr. Putnam. The family of Mr. Dutton and in fact all the neighbors not only visited the store, but also the sick at Putman's, Putnam's and Herford's. Among the families there were the following additional cases of the same disease: Mr. Dutton, one aged 17, recovered; Mr. Wiley, one aged 46, recovered; Mr. Geo. Welch, seven cases, two of which died; the ages of those who died in this family were 7 and 2 years; Mr. Simons, two cases, aged 19 and 24, recovered; Mr. Lilly, one case, which died after partial or apparent recovery; Mr. Wilkins, three cases, recovered. Besides the above, there were cases which recovered, in the families of Tim Welch, Geo. Maxon, and Mr. Decker. One of the sons of Geo. Welch gave instruction to the children of a Mr. Teachout, living some miles away. These children had the same disease, but recovered. Aaron Smith worked for Geo. Welch and had the disease lightly. There may have been other cases, with which the memory of my informants did not make me acquainted.

It should be remarked that one room of the house occupied by Mr. Dell Putman's family was used as a meat-market, and the sanitary condition of the house at the time of the appearance of the first case was said to be far from sanitary. It is not necessary, however, to suppose that the disease originated in this house. The little girl, Flossie Putman, the first case, frequently visited the store in which her father clerked and which was daily visited by lumbermen from various sections of the country.

My informants told me that in the cases which they saw the tonsils were covered with grayish-white or dirty-white membrane. The odor from those who died of the disease was said to be very powerful and disagreeable. Regurgitation of milk and other fluids on attempting to swallow was frequently observed. Of this symptom I can myself bear testimony as it existed at the time of my visit in one of the cases which I saw.

The condition of affairs at the time of my visit was as follows: There were only two cases known to exist at the time. These were the son and daughter of Geo. Welch, in whose family there had been, as stated above, seven cases with two deaths. The boy was walking about the house and yard, while the daughter was still in bed and suffered with cold extremities on account of the weak action of the heart. On one tonsil of the boy was a small, but well-marked membranous patch. Two small bits of this were detached with a sterilized needle and transferred to an agar tube. The girl still regurgitated liquid food. From the vault of the pharynx, a shred of membrane hung down in the throat. Bits of this were also removed and transferred to agar tube. The bacterial growths from these tubes have been examined since my return to Ann Arbor. The bacilli have been compared with the Löffler bacillus, which I had obtained in the laboratory of Dr. Koch at Berlin, and the identity of the two cannot be questioned. From the appearance and condition of the two patients whom I saw I did not hesitate to pronounce the disease diphtheria, and this diagnosis has been confirmed by the bacteriological examination.

The correspondence with which you furnished me shows the attitude of some of the physicians in this matter, and also shows that as a consequence of the stand taken by these physicians practically nothing had been done to prevent the spread of the disease. How any physician could have doubted the contagious nature of the disease as it spread from family to family is beyond my comprehension. The first and only house placarded was that of Geo. Welsh, and this was done not only without the advice of the attending physician, but, as I was informed, in opposition to his expressed wish. Had not the lay authorities of the townships taken the matter in hand, I suppose that no effort would have been made to check the spread of the disease. Public funerals were held and all the neighbors visited the sick without precautions, because the doctors said that the disease was not diphtheria or contagious.

In regard to the best thing to be done, I advised Messrs. Dimmick, Double and Dutton to proceed immediately to disinfect every house in which there had been a case of the disease. I also advised the disinfection of the school-house, in which some of the funerals had been held, the store and the hotel. The household goods of Mr. Dell Putman had been boxed and sent to Gaylord. I advised the disinfection of these also. The above named gentlemen pledged themselves to the performance of this work and I have no doubt that they will attend to it; but no one can tell the number of homes into which the germs of the disease have been introduced without manifesting their presence at the time and in which they may cause sickness and death in the future.

Respectfully,

V. C. VAUGHAN.

SCARLET FEVER IN MICHIGAN.

REPORT FOR THE YEAR ENDING DECEMBER 31, 1890.

Scarlet fever is a disease to be dreaded not only because of the deaths and the temporary suffering and disability caused by it, but also because often the organs of sight or hearing are so injured by the disease as to cause blindness or deafness for life.[*]

During the year ending December 31, 1890, there were reported to the office of the Secretary of the State Board of Health 481[†] outbreaks of scarlet fever in 417 localities in Michigan. In these outbreaks there were reported to have occurred 3,835 cases and 162 deaths. The following map exhibits the number of outbreaks, cases and deaths from scarlet fever in each county in Michigan during the year ending December 31, 1890. From this it may be seen that, of the 3,835 cases and 162 deaths in the whole State, 2,409 cases and 86 deaths were reported from the 28 counties comprising the southern four tiers of counties of the State. It may also be seen that from 10 of the 84 counties in the State there were reported 1,866 cases and 85 deaths, or nearly as many cases and more deaths than from all the remaining 74 counties. These 10 counties, in the order of cases, are as follows: Wayne county, 618 cases and 44 deaths; Kent, 312 cases and 9 deaths; Muskegon, 154 cases and 9 deaths; Huron, 146 cases and 3 deaths; Lenawee, 118 cases and 3 deaths; Saginaw, 113 cases and 6 deaths; Tuscola, 103 cases and 2 deaths; Bay, 101 cases and 4 deaths; St. Joseph, 101 cases and 2 deaths; Lapeer, 100 cases and 3 deaths.

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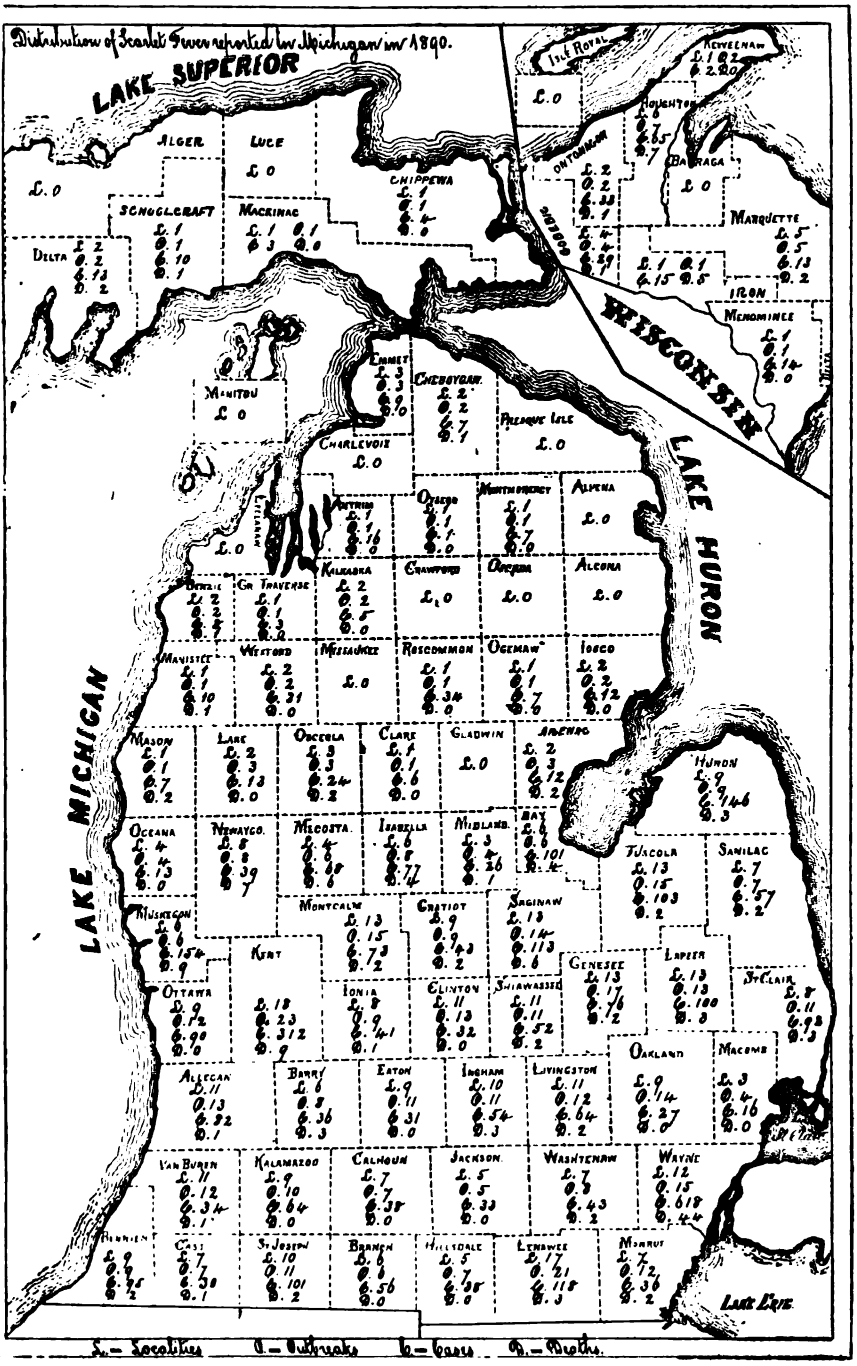
[*] According to the 10th Biennial Report of the Board of Trustees of the Michigan School for the Deaf, the loss of hearing of 39, or 11 per cent, of the 350 pupils in that institution during the two years 1889-90 who had lost their hearing since birth, was attributed to scarlet fever. Also according to the Fifth Biennial Report of the Board of Control of the Michigan School for the Blind, the loss of sight of 8, or 7.8 per cent of the 103 pupils in that school during the two years 1888-89 who became blind since birth, was attributed to scarlet fever.

[†] It is sometimes difficult to decide whether cases in a given place constitute one outbreak or more than one. In connection with a table and diagram on following pages the number of outbreaks is stated differently, but a foot-note gives the reason why.

DISTRIBUTION OF SCARLET FEVER IN MICHIGAN IN 1890.


Distribution of Scarlet Fever reported in Michigan in 1890.
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
Lake Erie
WISCONSIN
Isle Royal L. 0
Keweenaw L. 1 O. 2 C. 2 D. 0
Houghton L. 6 O. 7 C. 65 D. 7
Ontonagon L. 2 O. 2 C. 33 D. 1
Gogebic L. 4 O. 4 C. 29 D. 1
Baraga L. 0
Marquette L. 5 O. 5 C. 13 D. 2
L. 1 O. 1 C. 15 D. 5
Iron
Menominee L. 1 O. 1 C. 14 D. 0
Alger
L. 0
Luce L. 0
Chippewa L. 1 O. 1 C. 4 D. 0
Schoolcraft L. 1 O. 1 C. 10 D. 1
Mackinac L. 1 O. 1 C. 3 D. 0
Delta L. 2 O. 2 C. 13 D. 2
Manitou L. 0
Emmet L. 3 O. 3 C. 9 D. 0
Cheboygan L. 2 O. 2 C. 7 D. 1
Presque Isle L. 0
Charlevoix L. 0
Leelanaw L. 0
Antrim L. 1 O. 1 C. 16 D. 0
Otsego L. 1 O. 1 C. 1 D. 0
Montmorency L. 1 O. 1 C. 7 D. 0
Alpena L. 0
Benzie L. 2 O. 2 C. 5 D. 1
Gr Traverse L. 1 O. 1 C. 3 D. 0
Kalkaska L. 2 O. 2 C. 5 D. 0
Crawford L. 0
Oscoda L. 0
Alcona L. 0
Manistee L. 1 O. 1 C. 10 D. 1
Wexford L. 2 O. 2 C. 31 D. 0
Missaukee L. 0
Roscommon L. 1 O. 1 C. 34 D. 0
Ogemaw L. 1 O. 1 C. 7 D. 0
Iosco L. 2 O. 2 C. 12 D. 0
Mason L. 1 O. 1 C. 7 D. 2
Lake L. 2 O. 3 C. 13 D. 0
Osceola L. 3 O. 3 C. 24 D. 2
Clare L. 1 O. 1 C. 6 D. 0
Gladwin L. 0
Arenac L. 2 O. 3 C. 12 D. 2
Huron L. 9 O. 9 C. 146 D. 3
Oceana L. 4 O. 4 C. 13 D. 0
Newaygo L. 8 O. 8 C. 39 D. 7
Mecosta L. 4 O. 6 C. 68 D. 6
Isabella L. 6 O. 8 C. 77 D. 4
Midland L. 3 O. 4 C. 26 D. 1
Bay L. 6 O. 6 C. 101 D. 4
Tuscola L. 13 O. 15 C. 103 D. 2
Sanilac L. 7 O. 7 C. 57 D. 2
Muskegon L. 6 O. 6 C. 154 D. 9
Montcalm L. 13 O. 15 C. 73 D. 2
Gratiot L. 9 O. 9 C. 43 D. 2
Saginaw L. 13 O. 14 C. 113 D. 6
Kent L. 18 O. 23 C. 312 D. 9
Genesee L. 13 O. 17 C. 76 D. 2
Lapeer L. 13 O. 13 C. 100 D. 3
St Clair L. 8 O. 11 C. 93 D. 3
Ottawa L. 9 O. 12 C. 90 D. 0
Ionia L. 8 O. 9 C. 41 D. 1
Clinton L. 11 O. 13 C. 32 D. 0
Shiawassee L. 11 O. 11 C. 52 D. 2
Oakland L. 9 O. 14 C. 27 D. 0
Macomb L. 3 O. 4 C. 16 D. 0
Allegan L. 11 O. 13 C. 82 D. 1
Barry L. 6 O. 8 C. 36 D. 3
Eaton L. 9 O. 11 C. 31 D. 0
Ingham L. 10 O. 11 C. 54 D. 3
Livingston L. 11 O. 12 C. 64 D. 2
Van Buren L. 11 O. 12 C. 34 D. 1
Kalamazoo L. 9 O. 10 C. 64 D. 0
Calhoun L. 7 O. 7 C. 38 D. 0
Jackson L. 5 O. 5 C. 33 D. 0
Washtenaw L. 7 O. 8 C. 43 D. 2
Wayne L. 12 O. 15 C. 618 D. 44
Berrien L. 9 O. 9 C. 75 D. 2
Cass L. 7 O. 7 C. 30 D. 1
St Joseph L. 10 O. 11 C. 101 D. 2
Branch L. 6 O. 6 C. 56 D. 0
Hillsdale L. 5 O. 7 C. 38 D. 0
Lenawee L. 17 O. 21 C. 118 D. 3
Monroe L. 7 O. 12 C. 36 D. 2
L. – Localities O. – Outbreaks C. – Cases D. – Deaths.

SCARLET FEVER IN MICHIGAN IN 1890 COMPARED WITH PREVIOUS YEARS.

TABLE 1.—*Exhibiting the Number of Outbreaks, Cases and Deaths from Scarlet Fever, together with the Average Number of Cases and Deaths per Outbreak, and the per cent of Fatal Cases, reported to the Office of the State Board of Health for each of the eight years, 1882–90.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Deaths per 100 Cases.
1882	....	83	849	....	138	....	*16
1883†	164	150	1,802	11.	248	1.51	*14
1884‡	324	296	2,476	8.	230	.71	9
1885	356	337	2,750	8.	187	.53	7
1886	386	302	3,046	8.28	275	.71	9
1887	353	297	3,400	9.63	314	.89	9
1888	381	315	2,989	7.85	200	.52	6.7
1889	421	382	3,535	8.40	166	.39	4.6
1890	481	417	3,835	7.97	162	.34	4.2

* Probably in some instances only the fatal cases were reported.
† Use of the blank form "M" for weekly reports was begun in May, 1883.
‡ Use of the annual reports of health officers in compiling scarlet fever for the communicable disease article was begun in 1884.

TABLE 2.—*Exhibiting the number of reported Outbreaks of Scarlet Fever in Michigan during the years 1889 and 1890, with the number of Localities in which it occurred, the number of Cases and Deaths, the average number of Cases and Deaths per Outbreak, Deaths per hundred Cases, in each year; with the departure of the same for 1890 from 1889, and from the average of the same for the five years, 1884–9.*

Year.	Reported Outbreaks.	Reported Localities.	Reported Cases.	Av. No. of Cases per Outbreak.	Reported Deaths.	Av. No. of Deaths per Outbreak.	Deaths per 100 Cases.
1889	421	382	3,585	8.40	166	39	4.6
Average for 6 years 1884–1889	370	322	3,033	8.36	229	63	7.6
1890	481	417	3,835	7.97	162	34	4.2
Departure of 1890 from 1889	+60	+35	+300	—.43	—4	—5	—.4
Departure of 1890 from the average for 6 years, 1884–9	+111	+85	+802	—.39	—67	—29	—3.4

In Table 2 is shown a comparison of the numbers of reported cases of sickness and deaths from scarlet fever in the year 1890, with the same for the year 1889, and the averages for the six years, 1884–89. It will be seen that there were reported 60 more outbreaks and 300 more cases and 4 more deaths in 1890 than in 1889. That more cases of scarlet fever were reported in 1890 than in 1889 is probably due to more perfect reports in 1890. The system of the State Board for obtaining reports is steadily improving from year to year, and it is believed that health officers, clerks of local boards of health and the people generally, are becoming more and more alive to the importance of thorough reports. The increase in the numbers reported is not so apparent in the deaths as in the cases, less deaths were reported in 1889 than in 1888, and less in 1888 than in 1887. From the foregoing it may be inferred that in former years the *fatal* cases were more likely to be reported than were the mild cases, and that there is a growing tendency to report more of the mild cases.

MEASURES TAKEN TO RESTRICT SCARLET FEVER.—RESULTS.

The following are the substance of a few health officers' reports which are representative of the statements of those health officers whose reports indicated that they had quite carefully enforced isolation and disinfection.

Relative to an outbreak of scarlet fever in Mussey township, St. Clair county, which was confined to three cases in one house, the health officer, Dr. Duncan Patterson, reported in substance that the following measures were taken to restrict the spread of the disease:

The patients were kept isolated from all other persons except the mother, sister and the physician. The discharges were disinfected with carbolic acid and put in the privy vault. When the patients recovered all rooms in the house, and the clothing, bedding, etc., were disinfected with the fumes of burning sulphur at the rate of about three pounds of sulphur per 1,000 cubic feet of air space.

As to the measures of restriction in an outbreak in Pontiac, which was confined to the first case, the health officer, Dr. Mason W. Gray, reported in substance as follows:—

The house in which the case occurred was placarded, and the patient was kept isolated. The discharges were disinfected with copperas water. When the patient recovered all rooms in the house and the privy and clothing, bedding, etc., were disinfected with the fumes of burning sulphur at the rate of about three pounds of sulphur per 1,000 cubic feet of air space.

Relative to the measures taken to restrict the outbreak of scarlet fever in Ford River township, Delta county, which was confined to the first case, the health officer, O. E. Nelson, reported in substance as follows:—

The person sick was kept isolated from all other persons except the nurse and physician, and no one except the physician was allowed to go near the house. The discharges of the patient were buried and the privy vault was disinfected with two pounds of chloride of lime, and the privy was disinfected with fumes of sulphur. After the patient recovered all rooms in the house and the clothing, bedding, etc., were disinfected by the fumes of burning sulphur at the rate of about three pounds of sulphur per 1,000 cubic feet of air space.

Concerning the measures employed to restrict the spread of scarlet fever in an outbreak in Pennfield township, Calhoun county, which was confined to one case, the health officer, Richard Keeler, reported substantially as follows:—

A placard was posted, and the patient was placed in a room and no one was allowed to go into that room except the physician and nurse. The discharges of the patient were disinfected with chloride of lime and thrown into ihe privy vault, and the contents of the vault were disinfected with carbolic acid, and the privy was disinfected with the fumes of burning sulphur. When the case recovered all rooms in the house were disinfected with the fumes of burning sulphur, seven pounds of sulphur having been used for the purpose.

In reporting the restrictive measures employed in an outbreak in Dallas township, Clinton county, which was confined to the first case, the health officer, Dr. H. A. Stroud, stated substantially as follows:—

The house was placarded and the patient was kept isolated from all persons except the physician and the family. The discharges of the patient were disinfected with sulphide of zinc solution and then washed. After the recovery of the patient all rooms in the house were disinfected with fumes of burning sulphur. at the rate of about three pounds of sulphur per 1,000 cubic feet of air space.

VIOLATIONS OF PUBLIC HEALTH LAWS.—RESULTS.

The following instances illustrate how the public health laws are sometimes violated:

In reporting concerning an outbreak of scarlet fever at Benton Harbor, in which there were reported to have occurred 28 cases and one death, the health officer, Dr. F. M. Kerry, mentioned as exceptions to the complete accomplishment of the measures of isolation and disinfection recommended by the State Board of Health, the "carelessness and perverseness of some families and inability of others to have separate rooms." He also reported the origin of the outbreak as "probably from *concealed* cases," and he indicated that there were three families in which the disease existed who were not isolated.

Relative to the measures taken to restrict the outbreak of scarlet fever in Marion township, Sanilac county, the health officer, Dr. H. F. Alderton, stated that not all houses where cases occurred were disinfected with fumes of burning sulphur; that the quantity of sulphur burned was "not known"; that one funeral was public, and as to another he did not know. In this outbreak there were reported to have occurred 36 cases and two deaths.

Relative to the outbreak in Imlay township, Lapeer county, the health officer, Dr. W. Flagler, responded to the request to fully describe how he isolated the patients, and the other methods which he employed to restrict the disease, as follows: "I had absolutely nothing to do with these cases." To the question, "Was any room disinfected?" he replied, "Not to my knowledge." To the question, "How many of the cases can you trace to a former case?" he replied, "Ten or twelve." After reading these statements from Health Officer Flagler it is not surprising to find him adding that "The evidence of success attending the efforts [?] at restriction were *nil*"; nor is it strange that 20 cases and one death were reported to have occurred in this outbreak. A person who accepts the position of health officer should fully realize that he is the public guard over the health and lives of the people in his jurisdiction, and that it is his legal and solemn duty to personally see that every case of a dangerous communicable disease is promptly and strictly isolated, and on the death or recovery of the patient, to himself, thoroughly disinfect every infected thing, in accordance with the instructions supplied him by the State Board of Health.

Often, however, dangerous diseases are allowed to spread not by fault of the health officer, but because sometimes neither the attending physician nor the householder promptly reports the disease to the health officer as is required by law. Sometimes, too, in mild cases a physician is not called, and the nature of the disease is not learned until the disease developes severer symptoms, and, in the meantime, many have been exposed. It is extremely important that prompt notice be given to some officer of the local board of health, and preferably to the health officer, of every case of a dangerous communicable disease, that the local board may act, with the promptness of a fire department, to stamp out the first sparks before they spread and become a conflagration. The law, sections 1675 and 1676, Howell's Statutes, under heavy penalty, requires the physician attending a case of a disease dangerous to the public health and also the householder where the case exists, to give immediate notice of such case to the health officer, president or clerk of the local board of health. Under the head of, "How Scarlet Fever is Spread," in this article, a number of instances are given which illustrate how isolation and disinfection are sometimes neglected, and show something of the fatal consequences of such negligence.

PRACTICAL RESULTS IN RESTRICTING SCARLET FEVER.

Tables 3 and 4 and the following diagram compare the average numbers of cases and deaths in outbreaks of scarlet fever where the measures of isolation and disinfection, prescribed by the Michigan State Board of Health, were enforced, with the average number of cases and deaths in those outbreaks where these measures were neglected.* By Table 4 it may be seen that, during the five years, 1886-90, there were, on the average, over five times as many cases and over four times as many deaths in those outbreaks where these measures were neglected as in those outbreaks where these measures were enforced.

By Table 4 it may be seen that during the year 1890 there were reported to the office of the State Board of Health 477 † outbreaks of scarlet fever with 3,054 cases and 115 deaths. Had no efforts at restriction been made, and had the average numbers of cases and deaths per outbreak remained the same as in the column headed "Isolation and disinfection both neglected," there would have occurred 5,770 cases and 183 deaths, and taking from these respectively the cases (3,054) and deaths (115) which did occur, leaves 2,715 cases and 66 deaths indicated as prevented in these 477 outbreaks, by isolation and disinfection. By the same method, the indicated saving in the 1,857 outbreaks which occurred, during the 5 years, 1886-90, is 13,846 cases and 704 lives.

The above indicates only the lives saved and cases prevented in localities *after outbreaks had commenced.* There was also a large saving in the number of outbreaks in Michigan, for the reason that isolation and disinfection by preventing scarlet fever from spreading in localities where it already existed, probably in the same proportion prevented the disease from spreading from those localities and starting outbreaks in other localities. In this way, it is believed that the *number of outbreaks* in Michigan during 1890 was restricted in about the same proportion as the *number of cases* in all outbreaks was restricted; that is, about 25 (25.69) per cent, or 159 outbreaks were prevented. Assuming that in these 159 outbreaks the average numbers of cases and deaths per outbreak would have been the same as they averaged in those outbreaks where isolation and disinfection were neglected, there is indicated an additional saving of 61 lives and 1,924 cases by isolation and disinfection during 1890, making the total indicated

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* In the compilation of the reports for Tables 3 and 4 and the diagram showing the results obtained by isolation and disinfection, every effort has been made to place the numbers of cases and deaths in each outbreak in the proper columns. If, for instance, there were only one or two cases in an outbreak and the health officer neglected to isolate or disinfect, but for some reason the disease spread no further, the number of cases and deaths were placed in the column headed "Isolation and Disinfection both Neglected." If, on the other hand, as often occurs, quite a number of persons are exposed at the same time and place outside the health officer's jurisdiction, and by proper isolation and disinfection he succeeds in confining the disease to the original cases exposed, they are placed in the column headed, "Isolation and Disinfection Enforced." If, however, he neglects to properly isolate or disinfect, the whole number of these cases and deaths are placed in the "neglected" column. It is to be regretted that many of the reports received at this office do not state exactly what was done to restrict the disease, or are not sufficiently definite to enable the compilers to decide just what was done, and they are obliged to place all such in the column headed "Isolation or Disinfection or both not mentioned, or statements doubtful."

† Whenever a break of 60 days or more has occurred in the progress of scarlet fever in a given township, village or city, it has hitherto been regarded as two different outbreaks, but in estimating outbreaks for these tables, 3 and 4, and the corresponding tables for diphtheria, if the second appearance of the disease originated from the first the intermission was disregarded and it was treated as a single outbreak. Also, comparisons of *years* require that outbreaks be counted as closed at the close of the *year*; while in comparing *outbreaks* for testing the value of isolation and disinfection it is necessary to take *complete outbreaks*, even where they extend from one year into the next. This explains the apparent discrepancy between the number of outbreaks here given and the number given at the beginning of this article.

RESTRICTION OF SCARLET FEVER IN MICHIGAN.

TABLE 3.—*Scarlet Fever in Michigan in 1890, Exhibiting the Average Number of Cases and Deaths per outbreak:—(1) in all the 477 outbreaks reported, (2) in the 302 outbreaks in which it is doubtful whether or not Disinfection or Isolation was secured, (3) in the 17 outbreaks in which Isolation was neglected, and Disinfection was enforced or doubtful, (4) in the 94 outbreaks in which Disinfection was neglected, and Isolation was enforced or doubtful, (5) in the 44 outbreaks in which Isolation was enforced, and Disinfection was neglected or doubtful, (6) in the 16 outbreaks in which Disinfection was enforced and Isolation was neglected or doubtful, (7) in the 94 outbreaks in which both Isolation and Disinfection were neglected, (8) in the 42 outbreaks in which both Isolation and Disinfection were enforced, and (9) in the 136 outbreaks in which Isolation or Disinfection or both were neglected.*

	(1) All Outbreaks.* (477 outbreaks.)		(2) Isolation or Disinfection or both not mentioned or statements doubtful, (302 outbreaks.)		(3) Isolation Neglected, Disinfection enforced or doubtful. (17 outbreaks.)		(4) Disinfection Neglected, Isolation enforced or doubtful. (25 outbreaks.)		(5) Isolation Enforced, Disinfection neglected or doubtful. (44 outbreaks.)		(6) Disinfection Enforced, Isolation neglected or doubtful. (16 outbreaks.)		(7) Isolation and Disinfection both neglected. (94 outbreaks.)		(8) Isolation and Disinfection both enforced. (42 outbreaks.)		(9) Isolation or Disinfection or both Neglected. (136 outbreaks.)	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals..........	3,054	115	1,711	67	104	9	46	3	173	8	100	10	1,137	36	76	1	1,287	48
Averages.......	6.40	0.24	5.67	0.22	6.12	0.53	1.84	0.12	3.93	0.18	6.25	0.63	12.10	0.38	1.81	0.02	9.46	0.35

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* These do not include the cases in Detroit and Grand Rapids, because of the difficulty in determining the beginning and ending of an outbreak in these cities, in which the disease is present in some part of the city nearly all of the time.

TABLE 4.—*Exhibiting for the four years, and for each of the four years, 1886–90, the numbers of Reported Outbreaks, Cases and Deaths; also, for this five-year period, the Average numbers of Cases and Deaths per Outbreak, in all Outbreaks; in those outbreaks in which Isolation or Disinfection or both were doubtful; Isolation or Disinfection neglected; Isolation and Disinfection both neglected; Isolation and Disinfection both enforced; and, also, the numbers of Cases and Deaths indicated as having been prevented by Isolation and Disinfection.*

Years.	All Outbreaks.*			Isolation or Disinfection or both not mentioned or Statements Doubtful.			Isolation or Disinfection or both neglected.			Isolation *and* Disinfection both Neglected.			Isolation and disinfection both Enforced.			Cases and Deaths Indicated as having been prevented by Isolation and Disinfect'n	
	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Out-breaks.	Cases.	Deaths.	Cases.	Deaths.
1886	324	1,716	100	221	934	43	45	623	46	†	†	†	58	159	11	‡ 2,768	‡ 231
1887	299	1,882	141	190	1,200	93	45	581	87	33	440	24	64	148	11	§ 2,220	§ 177
1888	340	1,838	112	225	955	74	83	819	39	61	724	33	36	80	8	§ 2,198	§ 72
1889	417	2,822	123	284	1,453	61	87	1,290	54	72	1,308	48	52	149	10	§ 4,175	§ 156
1890	477	3,054	115	302	1,711	67	136	1,287	48	94	1,137	36	42	76	1	§ 2,715	§ 66
Totals	1,857	11,312	591	1,222	6,258	338	396	4,553	224	259	3,509	151	252	603	36	13,846	704
Averages, five Years	371	2,262	118	244	1,251	68	79	911	45	‖ 65	‖ 877	‖ 38	50	121	7	....	....
Av. Cases and Deaths per Outbreak	....	6.10	0.32	....	5.18	0.28	....	11.50	0.57	....	¶ 13.55	¶ 58	....	2.39	0.14	....	....

* Outbreaks in Detroit and Grand Rapids not included.

† Compilations for this column were first made in the year 1887.

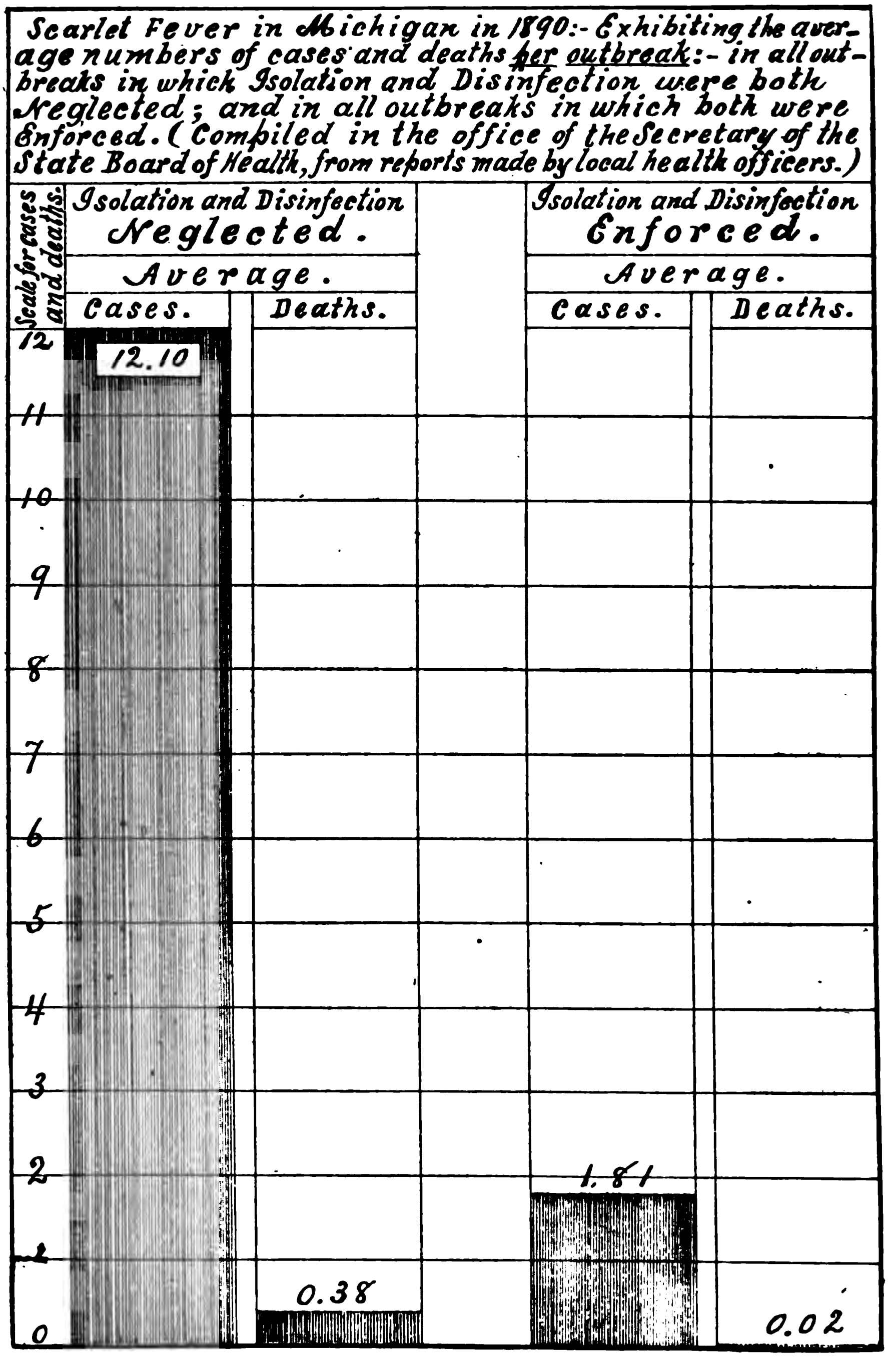
‡ These results are obtained by multiplying the total number of outbreaks for the year by the average number of cases (13.84) or deaths (1.02) per outbreak, which is obtained from the column "Isolation *or* Disinfection or both Neglected," and deducting from the results thus obtained the number of cases and deaths which *did* occur in the year 1886.

§ These results are obtained in the same manner as noted in the last foot-note above, except that the averages by which the whole number of outbreaks for each year is multiplied, are obtained from the column "Isolation *and* Disinfection both Neglected."

‖ Average for four years, 1887–90.

¶ Averages, cases and deaths, per outbreak for the four years, 1887–90.

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.



Scarlet Fever in Michigan in 1890:- Exhibiting the average numbers of cases and deaths per outbreak:- in all outbreaks in which Isolation and Disinfection were both Neglected; and in all outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)

saving for the year, 129 lives and 6,559 cases. By the same method there is indicated a total saving during the 5 years, 1886-90, of 2,694 lives and 49,633 cases, by the measures prescribed by the Michigan State Board of Health,- an average saving of 539 lives and 9,927 cases per annum during the 5 years.

SOURCE OF CONTAGIUM OF SCARLET FEVER, HOW IT IS SPREAD, AND VITALITY OF THE CONTAGIUM.

Of the 453 outbreaks of scarlet fever reported during the year 1890, as exhibited in the following table, the local health officers reported the source of contagium as follows:—Traced to a former case, 129; probably to a former case, 26; alleged unsanitary conditions, 5; unknown, 156; and for 136 outbreaks the source of contagium was not stated. The sources of 14 outbreaks were traced to places outside of the State, five of which places were in Ohio.

Reported Source of Contagium of Outbreaks of Scarlet Fever in 1890.	Outbreaks.
Traced to a former case	* 129
Probably to a former case	26
Meteorological conditions	2
Alledged Unsanitary conditions	5
Unknown (including "Sporadic," "Spontaneous," Epidemic and Endemic)	156
Not reported or reports not definite	138
All outbreaks	456

* Also most cases in outbreaks were traced to former cases.

Traced to a former case.

The following are extracts from the reports of local health officers who were able to trace the disease to a former case, with the name of the health officer and of his jurisdiction subjoined:

"Mrs. Lotzenhizer's parents live about one mile south in North Star township, and there were a number of cases in their family, and she went to help take care of them; her boy was taken sick and she returned with him."—*Dr. J. A. Guthrie, health officer of Emerson township, Gratiot county.*

"A cousin from Imlay City was visiting at the house, and while there developed the disease. One week from that the case I have reported took sick."—*Dr. Alexander Stewart, health officer of Hamtramck township, Wayne county.*

"From a party where family had had scarlet fever stopping over night with the family where the first case appeared."—*Dr. W. B. Mott, health officer, Benzonia township, Benzie county.*

"Moved in town from Paw Paw village one week before taken sick. The disease was existing there at the time—was exposed there before moving."—*Denison Cornish, health officer, Porter township, Van Buren county.*

"The mother and child were visiting in the place where the disease was. The child was taken sick two days after coming home."—*T. J. Ritter, health officer, Dexter.*

"Young lady was at work in the township of Paw Paw, and came home sick with scarlet fever."—*Dr. Albert S. Haskins, health officer, Lawrence township, Van Buren county.*

"A lady from Detroit in whose family there had been cases of scarlet fever a short time before visiting this family, about two weeks previous to the occurrence of this outbreak."—*Thomas H. Mathews, M. D., health officer, Redford township, Wayne county.*

"Cases were caused from contact with convalescents from Holland."—*J. B. McNett, M. D., health officer, Grand Haven.*

"The first case contracted the disease while in Shiawassee county—came in contact with a child having fever."—*R. K. Struble, health officer, Argentine township, Genesee county.*

The above outbreak in Argentine township occurred January 30, 1890. Concerning the source of contagium of an outbreak, August 3, in that township, Dr. Joseph Marshall, the attending physician, reported that "they went berrying last week and came in contact with some people who said their children had scarlet fever."

"Supposed to be from a case of scarlet fever in a young lady attending school at Battle Creek. Miss S. sat in seat adjoining. Case had been absent from school five weeks. Miss S. came down in just one week after sitting beside her."—*C. C. Smith, M. D., health officer, Bedford township, Calhoun county.*

"Was brought from St. Ignace by a family visiting there during an outbreak of scarlet fever."—*W. G. Young, M. D., health officer, Mackinaw City.*

"The disease was contracted while visiting at Garden township."—*E. O. Nelson, health officer, Ford River township, Delta county.*

"The father of the family first taken had been to a neighboring county where scarlatina was present, and the probabilities are that he carried the germs of the disease on his person or clothing."—*W. A. Burnham, M. D., health officer, Rockland township, Ontonagon county.*

"Brought here by a patient coming from Pontiac."—*J. E. Wilson, M. D., health officer, Avon township, Oakland county.*

"For case recorded as No. 1, it was a child that had visited the family a few days previously."—*E. A. P. Riky, M. D., health officer, Orion township. Oakland county.*

"One of the family, working in Reed City, was taken and brought the disease here."—*B. Arnold, M. D., Lincoln township, Osceola county.*

"The child contracted the disease in an adjoining township from relatives."—*C. C. Eply, M. D., health officer, Palo.*

"Was by these five children playing with other children some six weeks after having scarlet fever."—*Joseph H. Hawkins, health officer, Liberty township, Jackson county.*

"By contracting of parties outside of Brady."—*John C. Drake, M. D., health officer, Brady township, Saginaw county.*

"Cases occurred 24 hours after a picnic from which a child went home sick with sore throat, etc. All children afterwards taken had either been to the picnic or were exposed by those who had been."—*Joseph A. Patton, M. D., health officer, Chapin township, Saginaw county.*

"The contagion traced to persons so affected on the east side (formerly East Saginaw). It was so in nearly every case."—*N. D. Lee, M. D., health officer, Saginaw (W. S.).*

"For case recorded as number 142 [first case of scarlet fever in this outbreak] it was exposure on train from Ann Arbor, nine days previous."—*A. G. Graybiel, M. D., health officer, Caledonia township. Kent county.*

"By children from Ionia county attending meetings and school who did not know as they had scarlet fever."—*John L. Covert, M. D., health officer, Vergennes township, Kent county.*

"Conveyed from the city (Grand Rapids?) by visiting families."—*Samuel White, health officer, Walker township, Kent county.*

"The source of contagium * * * was Red Jacket, Michigan."—*John MacRae, M. D., health officer, Sherman township, Keweenaw county.*

"The disease was spread from Emerson, the adjoining township."—*S. M. Scott, health officer, North Star township, Gratiot county.*

"It was brought by a family moving into the township."—*Allen J. King, M. D., health officer, Sodus township, Berrien county.*

"The exposure of the child while visiting in Fremont, Indiana."—*M. E. Skinner, M. D., California township, Branch county.*

"Child brought from Butler, Indiana, where the disease had been prevailing."—*C. L. Wilbur, M. D., health officer, Hillsdale.*

"The mother went visiting with the child to Calumet, Houghton county, and their neighbors had two children down sick with the disease."—*Alfred David, M. D., health officer, Adams township, Houghton county.*

"For cases recorded as Nos. 1, 2, 3, 4, 5, 6 and 7 it was from the first being at school with the B—— girl [whose case of scarlet fever] is reported in my [Attica] township report."—*Anthony Williams, health officer, Attica.*

"From clothing of an aunt [from Kingston, Tuscola county] who visited the family."—*C. W. Clark, M. D., health officer, Clifford.*

"Brought by children from Hudson while there was an epidemic of scarlatina at that place,—they visited the public school."—*E. J. C. Ellis, M. D., health officer, Clayton.*

"Members of family that had had the fever in family, but, as I *supposed*, had been thoroughly disinfected, visiting neighbors."—*M. A. Jerome, M. D., health officer, Fairfield township, Lenawee county.*

"It was brought by a man going to Stanton and bringing a girl here that had been exposed, and she has spread it."—*R. W. Devereaux, clerk, Crystal township, Montcalm county.*

"For the case recorded as 17 [the first case of scarlet fever in this outbreak] it was from direct exposure, and so with all the other five."—*H. A. Forsyth, M. D., health officer, Lakeview.*

"The parents went to Lakeview where a relative was sick with scarlet fever, and about one week after returning home the child came down with scarlet fever."—*C. C. Sayles, M. D., health officer, Pine township, Montcalm county.*

"From contact with infected people from Argentine, Genesee county."—*William Harper, M. D., health officer, Deerfield.*

"Brought from Cleveland, Ohio, by children's parents."—*Emerson McCay, clerk, Jasper township, Midland county.*

"Henry W—— brought it from Fremont township, Sanilac county, Michigan."—*Lemuel Beal, M. D., health officer, Grant township, St. Clair county.*

"From a lady and child visiting from Saginaw county that had scarlet fever two months previous."—*Otis Gould, M. D., health officer, Rush township, Shiawassee county.*

"Cases recorded as 51 and 52, scarlet rash, came from Mancelona."—*Alanson H. Barden, health officer, Rapid River township, Kalkaska county.*

"From Decatur."—*Albert B. Cornell, M. D., health officer, Kalamazoo.*

"Brought from Hudson."—*William B. Town, M. D., health officer, Rollin township, Lenawee county.*

"Contagion in Metamora."—*A. S. Wheelock, M. D., health officer, Atlas township, Genesee county.*

"Carried in clothing."—*Edmund Bachman, M. D., health officer, Fenton.*

"Previous case."—*F. H. Callon, M. D., health officer, Genesee township, Genesee county.*

"Exposure."—*A. B. Clark, M. D., health officer, Clayton township, Genesee county.*

"Exposed."—*William M. Slaght, M. D., health officer, Grand Blanc township, Genesee county.*

"From Toledo, Ohio."—*K. K. Harrison, M. D., health officer, Erie township, Monroe County.*

"By a visit in a family in Toledo."—*Charles T. Southworth, M. D., health officer, Monroe.*

"First two from Hillsdale."—*O. W. Fowle, M. D., health officer, Moscow township, Hillsdale county.*

"Contagion by contact."—*J. R. Shaffer, M. D., health officer, Sumner township, Gratiot county.*

"Imported from New York City."—*A. I. Lawbaugh, M. D., health officer, Osceola township, Houghton county.*

"Contagion from Muskegon."—*James G. Jackson, M. D., health officer, North Muskegon.*

"From a case in the village of Hesperia."—*S. B. Rolison, M. D., health officer of Denver township, Newaygo county.*

"Brought here by a patient coming from Pontiac."—*J. E. Wilson, M. D., health officer, Avon township, Oakland county.*

"At school in the country."—*J. W. Warren, clerk, Hayes township, Otsego county.*

"Caught from the city (Saginaw?)."—*Fred Richer, health officer, Buena Vista, Saginaw county.*

"Carried from Chicago."—*William Westcott, clerk, Covert township, Van Buren county.*

"Direct exposure."—*Henry M. Avone, M. D., health officer, Park township, St. Joseph county.*

"Exposed at Grand Rapids."—*S. R. Robinson, M. D., health officer, White Pigeon.*

"Brought from Caro."—*J. T. Kane, health officer, Almer township, Tuscola county.*

"Brought to this town by a lady who had been visiting in another town."—*Robert Wood, health officer, Dayton township, Tuscola county.*

"From Caro, Michigan."—*S. J. Smith, M. D., health officer, Fair Grove township, Tuscola county.*

How Scarlet Fever is Spread.

Dr. John R. Williams, M. D., health officer of White Pigeon township, St. Joseph county, in his report of February 15, 1890, relative to scarlet fever, stated as follows:—

"I find great trouble in making the people understand that the rash—scarlet rash—is scarlet fever, and requires the same diligence to prevent contagion. * * * Yesterday I was informed by the physician who had been in attendance that scarlet fever existed in the family of one J. P——, some five miles in the country. Visiting the family, I found that the children, three in number, were taken sick Friday last. Dr. R—— was called in, diagnosed scarlet fever. Dr. S—— * * * was called in, who said it was the 'grippe', the eruption often came with the 'grippe', etc. Consequently Dr. R—— was discharged, and Mr. P—— had gone to attend a public sale, notwithstanding that three well-marked cases of scarlet fever were in his house."

Relative to the spread of scarlet fever in an outbreak in Lincoln township, Isabella county, in which 16 cases and 2 deaths were reported to have occured, the health officer, W. E. Preston, in a letter, March 3, reported as follows:—

"The first case that broke out in this township, so far as I can learn, the child came down in school. She was attended by a physician, but died February 24. I have received no report of that case from the physician or family. The patient's name was J——. The other fatal case terminated March 1. In this family one other child is sick with the same, but is improving. No report was made in either case there. Neighbors went there, and afterwards attended the meetings spoken of before (revival meetings) wearing the same clothing they did while attending the patients. The next case I investigated was at Mr. M——'s where there are four sick with scarlet fever. All are improving. No report has been made by the attending physician, or others, in this instance, and no notice has been posted warning the public that scarlet fever was there. The next was Mr. A——'s where two are sick with the same fever. No physician has been employed, no report has been made, and no notice posted. The next place visited was Mr. B——'s where one child has had the fever and recovered and two more are sick with it. No medical attendance has been employed, no report to me, and no notice posted. * * * There are two other places where scarlet fever has been. * * * No report has been made to me of either of them."

Relative to the spread of scarlet fever in Sodus township, Berrien county, in which 21 cases occurred, the health officer, Allen J. King, reported as follows:—

"The last case in the Tilstrom family (see annual report, 1889) [case reported in 1889] had suppuration of the submaxillary glands, which opened externally, and were not healed when he entered school this spring."

The following is quoted from a letter, of December 30, from S. S. C. Phippen, M. D., health officer of the city of Owosso, concerning the spread of scarlet fever:—

"I received a card from you, dated the 17th inst., saying that you had written to the health officers of Caledonia and Shiawassee townships urging immediate action for the restriction of the outbreaks in those townships. I don't know whether they have taken any precautions or not. If they have the precautions are mighty poor, and judging from the results I would not think there had been any action for the restriction of the outbreaks at all. Two of the cases here were caused by members of the first family sick with it, in Shiawassee township, calling at a relative's house in the city 'every time they came to town,' as the relative informed me. She also said a certain physician said that there was no danger in their calling. Two cases were probably caused by attending a wedding in Caledonia township. And, by the way, are there any cases at Mt. Morris? A family from there attended the same wedding, and their child was said to have left here sick with sore throat and fever. One case here was probably caused by exposure in a grocery store, as he said he waited on parties from Caledonia township in whose family scarlet fever existed."

Concerning an outbreak of scarlet fever in the city of Charlotte, the health officer, A. R. Stealy, M. D., reported as follows:—

"Two children who came here with their mother from Kalamazoo, on a visit home had a rash developed two or three days before they left their home * * * two cases of fever shipped in, so to speak, from Kalamazoo."

Concerning an outbreak in Richfield township, Genesee county, the health officer, Elmer D. Gardner, M. D., reported as follows:—

"There has been scarlet fever of a light form in two other families of the township, to which the cases in this family are traced. None have been sick enough to require medical attendance, but this one. I have traced it through these three families to another in Forest township, and from there to Otisville. * * * There was a dispute among the doctors there as to the disease (Regular and Eclectic doctors). No doubt there have been other cases in this township to which my attention has not been called."

Concerning the spread of typhoid fever in Gilford township, Tuscola county, where 12 cases and one death occurred, the health officer, Wm. H. Lindsly, reported as follows :—

"After being shut up certain parties went outside contrary to orders;" and later the health officer reported that the source of contagium of "scarlet fever was by occupant of former [infected?] houses going to their neighbor's house."

Relative to the spread of scarlet fever in the village of Highland Park, the health officer, Alexander Stewart, M. D., reported the following :—

"From his neighbor's children who, I am informed, had the disease previous to this outbreak; but no report was made to the board of health." In this outbreak isolation was not enforced, as Dr. Stewart reported that "the father was going round in the community and liable to spread contagium."

Concerning the spread of scarlet fever in an outbreak in Mt. Pleasant, February 15, in which 16 cases and two deaths were reported, the health officer, W. E. Preston, M. D., reported as follows :—

"I did not know of the fever until 10 were sick. Only two cases were reported by physicians."

George Bates, M. D., health officer of Novesta township, Tuscola county, reported as follows relative to the introduction of scarlet fever into his jurisdiction :—

"Family with the child (in whom the scarlet fever developed later) were visiting in Port Huron and were at a house where scarlet fever was present. Means were taken for prevention there, but they were not sufficient, as patient came down about three weeks after coming home."

Concerning the introduction of the disease into Antwerp township, Van Buren county, the health officer, I. E. Hamilton, M. D., reported as follows :—

"Find that the disease was brought here from Dakota. A lady came from there bringing a trunk with clothing. There had been scarlet fever in her family about six weeks before."

Dr. George D. Slocum, health officer of the city of Bessemer, reported, relative to the spread of scarlet fever in his jurisdiction, as follows :—

"It started from a child from one of these families going to school when it had the disease in a very light form, and no one suspected the child having it until it began to show itself in other cases."

Concerning the spread of scarlet fever in an outbreak in the village of Lake Linden, in which 30 cases and one death were reported, the health officer, Melville E. DeLaval, M. D., stated as follows :—

"The only trouble is that the people do not send for the doctor soon enough, and sometimes a child will attend school for a few days sick and not seen by a physician."

Relative to the spread of scarlet fever in an outbreak in the village of Watervliet, in which 28 cases and one death were reported, the health officer, J. F. Berringer, M. D., stated as follows :—

"From a 'Holiness camp meeting' held in the adjoining township of Covert. Being very mild in form it became disseminated before any of our physicians knew of it."

Dr. Rush J. Shank, health officer of the city of Lansing, in his report of a case of scarlet fever, October 6, 1890, stated as follows :—

"The danger of the spreading of the disease * * * into the jurisdictions of other boards of health is great for the reason that she traveled from Olga, Michigan, to Lansing, Michigan, by railroad after she was taken sick, and had been caring for persons sick with scarlet fever."

Cases like the above, where persons sick with scarlet fever travel from place to place, are no doubt the cause of some of the outbreaks of scarlet fever where the source of contagium is obscure and cannot be traced by the health officers.

Relative to an outbreak in Talmage township, Ottawa county, John W. Hopkins, health officer, reported the following:—

"It is supposed that the child (the first case) caught disease at Berlin fair. People were on the ground who have been having said disease in Grand Rapids. She (the child) came in contact with them—supposed to have been kissed or handled by some one of them. Second case, from parties who came from Dakota this fall with the disease in one of the children—did not know that the child had disease until it was peeling." Concerning a later outbreak, Dr. Hopkins reported that "The family in which disease existed came from the upper peninsula of this State; some members had disease there; those who did not, had it here after they came."

Concerning an outbreak of scarlet fever in Rockland township, Ontonagon county, the health officer, W. C. Gates, M. D., reported as follows:—

"Had been in the same family a short time before. His sister had the disease and after she was out of quarantine had an abscess on the neck which had not healed when he was brought home."

The following are reports of health officers relative to the mode of the spread of scarlet fever, with the name of the health officer and locality subjoined:—

"For the case recorded as No. 1, it was from a family coming from Rockland. The children had a rash, but not sick enough to send for a physician; but the disease was probably scarlatina."—*J. P. Jordan, M. D., Ontonagon.*

"Introduced into my jurisdiction by visitor from Tuscola county recovering from scarlet fever."—*James W. Goodfellow, health officer, Venice township, Shiawassee county.*

"Cases recorded as numbers 9, 16, 17 and 18 can be traced to families of numbers 13 and 14 who were sick with scarlet fever, and the father peddled milk to the former."—*M. C. Heath, health officer, Cadillac.*

"From an extremely mild case, not known to have been scarlet fever, the case not being seen by a physician."—*George W. Mahoney, M. D., health officer, Decatur.*

"Did not hear of the outbreak until it was most over."—*B. Arnold, M. D., health officer, Lincoln township, Osceola county.*

"Henry W—— brought it from Fremont township, Sanilac county, Michigan. Six weeks after he fully recovered Mrs. W—— washed his clothes thoroughly, and sent him to Blaine to school. She cannot become reconciled to the fact that Henry was the source of the contagium."—*Lemuel Beal, M. D., health officer, Grant township, St. Clair county.*

"By being brought in contact with a child supposed to have tonsilitis, but which was scarlet fever."—*Alexander Magill, M. D., health officer, Midland.*

"The source of contagium * * * of case number 5 was by a letter sent from Northern Michigan by a girl recovering from disease; of case number 6, by contagium from number 5."—*Alexander G. Graybiel, M. D., health officer, Caledonia township, Kent county.*

"A child who died in the country and was brought here for burial, said to have died from pneumonia, appears to have been the source of contagium of the four cases now sick, as upon investigation I am satisfied the case was scarlet fever complicated with pneumonia."—*Edwin Eaton, M. D., health officer, Hudson.*

"From another family having it, several weeks before, very mild, and not believing it scarlet fever did not properly disinfect."—*Dallas Warren, M. D., health officer, Milford.*

"An outbreak at the Michigan Military Academy spread to our city by a cadet being moved to his home here, after coming down with the disease."—*Mason W. Gray, M. D., health officer, Pontiac.*

"Brought by sister from adjoining township where disease was not called scarlet fever by attending physician."—*C. W. Howland, health officer, Newark township, Gratiot county.*

"By parties visiting while peeling."—*E. B. Sabin, M. D., health officer, Wheatland township, Hillsdale county.*

TABLE 5.—*First, second and third localities, where the second locality was infected with scarlet fever from the first, and the third was infected from the second; and the numbers of cases and deaths from scarlet fever in the first, second and third localities. (Compiled from reports of health officers who were able to trace the source of contagium to other localities.)*

Primary Localities from which Scarlet Fever Spread.	In First Locality.		Secondary Localities infected from Primary.	In Second Locality.		Tertiary Localities infected from Secondary.	In Third Locality.	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
Allegan county: Leighton township..	*	----	Barry county: Thornapple township .	12	2			
Antrim county: Mancelona village....	*	----	Antrim county: Custer township.......	16	0			
			Kalkaska county: Rapid River township.	2	0			
Bay county: Bay City................	70	3	Kent county: Caledonia township...	2	0			
			Arenac county: Au Gres township	7	1			
			Tuscola county: Juniata township	11	1	Tuscola county: Fair Grove township	2	0
Calhoun county: Battle Creek city	26	0	Calhoun county: Bedford township	1	0			
Delta county: Garden township.....	*	----	Delta county: Ford River	1	0			
Genesee county: Otisville village	2	0	Genesee county: Forest township........	8	0	Genesee county: Richfield township..	30	0
Gratiot county: North Star township	8	0	Gratiot county: Emerson township	1	0			
Houghton county: Calumet village.......	*	----	Houghton county: Adams township........	1	0			
Houghton county: Schoolcraft township	4	0	Houghton county: Torch Lake township..	13	0			
Ionia county: Ionia township.......	1	0	Ionia county: Ronald township	15	0			
Ionia county............	----	----	Kent county: Vergennes township...	11	0			
Isabella county: Mt. Pleasant city....	15	1	Isabella county: Lincoln township......	16	2			
Kent county: Grand Rapids city...	215	7	Barry county: Nashville village	2	0			
			Kent county: Paris township	2	0			
			Ada township...........	3	0			
			Mecosta county: Big Rapids city.........	10	1			
			Ottawa county: Talmadge township ...	1	0			
			St. Joseph county: White Pigeon village..	3	0			
			White Pigeon township	6	0			
Lake county: Glencoe township...	*	----	Ingham county: Lansing city............	4	0			
Lapeer county: Metamora village....	4	0	Genesee county: Atlas township	1	0			

* This outbreak was not reported to this office by the health officer of the "Primary" locality at the time it occurred.

TABLE 5.—CONTINUED.

Primary Localities from which Scarlet Fever Spread.	In First Locality. Cases.	In First Locality. Deaths.	Secondary Localities infected from Primary.	In Second Locality. Cases.	In Second Locality. Deaths.	Tertiary Localities infected from Secondary.	In Third Locality. Cases.	In Third Locality. Deaths.
Lapeer county: Hadley village	*	....	Lapeer county: Columbia village	5	1			
Lapeer county: Imlay City village	3	1	Wayne county: Hamtramck township	1	0			
Lenawee county: Hudson village	4	0	Lenawee county: Clayton village Rollin township	4 4	0 0			
Livingston county: Oceola township	7	0	Livingston county: Howell township	3	1			
Mackinac county: St. Ignace city	*	....	Cheboygan county: Mackinaw city	5	1			
Mecosta county: Hinton township	*	....	Mecosta county: Millbrook township	13	2			
Montcalm county: Cato township	1	0	Montcalm county: Day township	11	0			
Montcalm county: Lakeview village	6	1	Montcalm county: Pine township	1	0			
Muskegon county: Muskegon city	129	9	Muskegon county: North Muskegon village	6	0			
Newaygo county: Bridgeton township	*	....	Newaygo county: Garfield township	6	1			
Newaygo county: Hesperia village	*	....	Newaygo county: Denver township	1	0			
Oakland county: Oxford village	1	0	Oakland county: Orion township	3	0			
Oakland county: West Bloomfield	*	....	Oakland county: Pontiac city	2	0	Oakland county: Avon township	3	0
Ontonagon county: Rockland township	16	1	Ontonagon county: Ontonagon village	17	0			
Osceola county: Reed City village	*	....	Osceola county: Lincoln township	8	1			
Ottawa county: Holland city	46	0	Ottawa county: Grand Haven city	7	0			
Saginaw county: Saginaw city (E. S.)	*	....	Saginaw county: Saginaw City (W. S.)	78	2			
Saginaw county	....	....	Shiawassee county: Rush township	4	0			
Sanilac county: Fremont township	*	....	St. Clair county: Grant township	17	0			
Sanilac county: Port Sanilac village	*	....	Huron county: Sand Beach village	100	0			
Shiawassee county	....	....	Genesee county: Argentine township	7	0	Livingston county: Deerfield township	11	0
Shiawassee county: Shiawassee township	*	....	Shiawassee county: Owosso city	12	0			

* This outbreak was not reported to this office by the health officer of the "Primary" locality at the time it occurred.

TABLE 5. -CONTINUED.

Primary Localities from which Scarlet Fever Spread.	In First Locality. Cases.	In First Locality. Deaths.	Secondary Localities infected from Primary.	In Second Locality. Cases.	In Second Locality. Deaths.	Tertiary Localities infected from Secondary.	In Third Locality. Cases.	In Third Locality. Deaths.
St. Clair county: Port Huron city	12	1	St. Clair county: Capac village	1	0			
			Lapeer county: Attica township	11	0			
			Tuscola county: Novesta township	1	0			
St. Joseph county: Three Rivers village	71	2	St. Joseph county: Centreville village	1	0			
			Kalamazoo county: Kalamazoo city	30	0	Kalamazoo county: Kalamazoo township	4	0
						Eaton county: Charlotte city	2	0
Tuscola county: Caro village	2	0	Tuscola county: Almer township	1	0			
			Fair Grove township	1	0			
Tuscola county: Watrousville village	*	----	Tuscola county: Fair Grove township	2	0			
Tuscola county: Watertown township	3	0	Lapeer county: Rich township	5	1			
Tuscola county	----	----	Shiawassee county: Venice township	10	0			
Tuscola county: Kingston village	*	----	Lapeer county: Burlington township	2	0			
Van Buren county: Paw Paw village	*	----	Van Buren county: Porter township	5	0			
Washtenaw county: Ann Arbor city	*	----	Barry county: Johnstown township	11	1			
Wayne county: Detroit city	566	41	Ionia county: Ionia city	2	1			
			Lenawee county: Clinton village	1	0			
			Wayne county: Redford township	3	0			
			Sumpter township	8	0			
Wexford county: Cadillac city	29	0	Osceola county: Highland township	11	1			
Upper Peninsula	----	----	Ottawa county: Talmadge township	3	0			
(Outside of Michigan.)								
Chicago	----	----	Van Buren county: Covert township	5	0	Berrien county: Watervliet township	28	1
Dakota	----	----	Van Buren county: Antwerp township	1	1			
			Ottawa county: Talmadge township	2	0			
Indiana	----	----	Hillsdale county: Hillsdale city	4	0	Hillsdale county: Moscow township	13	0
			Branch county: California township	3	0			

*This outbreak was not reported to this office by the health officer of the "Primary" locality at the time it occurred.

TABLE 5.—CONTINUED.

Primary Localities from which Scarlet Fever Spread.	In First Locality.		Secondary Localities infected from Primary.	In Second Locality.		Tertiary Localities infected from Secondary.	In Third Locality.	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
Kansas	....	....	Mecosta county: Big Rapids city	38	2			
Minnesota	....	....	Montcalm county: Maple Valley township	4	0			
New York City	....	....	Houghton county: Osceola township	16	6	Houghton county: Red Jacket village †	3	0
			Schoolcraft county: Manistique village	10	1			
Ohio	....	....	Lenawee county: Ogden township	11	2			
			Midland county: Jasper township	5	0			
			Monroe county: Monroe city	11	1			
			Erie township	2	1			

† From this locality the contagium was reported as having been carried to Sherman, Keweenaw county, where one case occurred. This was the only instance in which the disease was reported to have been traced to a fourth locality.

Vitality of the Scarlet Fever Germ.

The following letters and reports of health officers and physicians indicate that the scarlet fever germ retains its vitality for a long time outside the human body, in an apparently dormant or inactive state, in houses, clothing, carpets, furniture, etc., and is then capable of developing scarlet fever in persons coming into such houses or in contact with or near such articles,—showing the importance of carefully disinfecting all infected houses and articles, even where they are not to be used for a long time.

The following is a copy of a letter, of January 29, 1890, from Dr. J. A. Wessinger, of Howell, bearing upon the subject:—

> "I desire to communicate to you a little bit of experience along the line of the development of the contagium of scarlet fever; how, under favorable circumstances, the germ may live and reproduce itself. In the northeast part of the township of Oceola, this county, there is a dwelling in which, six years ago, there were several cases of scarlatina. Shortly after the recovery of the children, the people moved away from the house leaving their rubbish in a back room. Also, the house was not fumigated. This house remained vacant until about two months ago when Mr. W——, having a wife and one child, occupied this place as a dwelling. On the 24th December, last, Mr. W——'s child was taken sick with scarlatina. On the 25th, Christmas day, Mr. W——'s brother-in-law, Mr. A——, together with his wife and three children, spent the day with Mr. W——. Mr. A——'s residence is in the northwest part of Howell township, this county. On Jan. 4, 1890, Mr. A——'s oldest boy was taken sick with scarlatina. On Jan. 12, 1890, Mr. H—— and child, age 5, visited at the home of Mr. W—— (Mr. H—— is a near neighbor to Mr. W——). On Jan. 19, the child of Mr. H—— was taken with a severe type of scarlatina. This case has since died. On Sunday, Jan. 19, the family of Mr. B—— visited at Mr. H——'s. On Jan. 25, Mr. B——'s only child was taken sick with scarlatina.

"The points that have been of interest to me in this outbreak are as follows:—

"1. The length of time that the germ of scarlatina may remain dormant, and still retain its vitality and capacity for growth and development when a favorable nidus is presented.

"2. The wide territory over which the disease is often spread through carlessness and negligence.

"3. That while we may have a series of mild cases of scarlatina, yet we may, in the very midst of these, get one or two cases in which the disease developes itself in a malignant form; as in the above history, you will notice, there were three mild cases, while one was severe enough to kill the patient."

The following are reports of health officers on this subject with the name of the health officer and his jurisdiction subjoined:—

"For the case recorded as number 1 it [the contagium] was from a previous attack in same family eight years before."—*John MacRay, M. D., health officer, Sherman township, Keweenaw county.*

"The first case occurred in house where they had scarlet fever five years ago, and, in my opinion, must have remained in some old clothing."—*E. E. Hendershott, M. D., Ridgeway township, Lenawee county.*

"From a lady and child, visiting from Saginaw county, that had scarlet fever two months previously." —*Otis Gould, M. D., health officer, Rush township, Shiawassee county.*

"Harry W—— brought it from Fremont township, Sanilac county, Michigan, six weeks after he fully recovered."—*Lemuel Beal, M. D., health officer, Grant township, St. Clair county.*

"Find that the disease was brought here from Dakota. A lady came from there bringing a trunk with clothing. There had been scarlet fever in her family about six weeks before."—*I. E. Hamilton, M. D., health officer, Antwerp township, Van Buren county.*

"From another family having it several weeks before very mild, and, not believing it scarlet fever did not properly disinfect."—*Dallas Warren, M. D., health officer, Milford.*

REPORTED PERIOD OF INCUBATION OF SCARLET FEVER.

The following two tables exhibit the reported experience of the health officers in Michigan during the year 1890 concerning the period of incubation of scarlet fever:

TABLE 6.—*Exhibiting the Reported Period of Incubation, in Days, for Scarlet Fever in 77 instances. Compiled from Health Officers' reports received for the year 1890.*

	Period of Incubation.																	
Period stated in days...	1	2	3	4	5	6	7	8	9	10	11	12	14	15	21	22	28	30
Number of instances in each period	3	3	4	1	4	* 4	†20	11	**4	‡ 5	2	1	§ 9	1	2	1	‖ 1	1

* In one instance reported "about 6 days."
† Includes four instances reported as "about 7 days."
** Includes one instance reported as "about 9 days."
‡ Includes two instances reported as "about 10 days."
§ Includes two instances reported as "about 14 days."
‖ Reported as "about 4 weeks."

The average of the above 77 reported periods of incubation is nearly nine (8.83) days; but the greatest number in any single period is that of seven days.

TABLE 7.—*Exhibiting relative to twenty-one instances of Scarlet Fever in Michigan in 1890, the Reported Period of Incubation within certain limits, stated in days; also the Means, the average of which may represent the average Period of Incubation.*

Days.	Means.	Days.	Means.	Days.	Means.
1.5 to 6	3.75	4 to 6	5.	7 to 21	14.
2 to 6	4.	4 to 10	7.	9 to 10	9.5
2 to 14	8.	5 to 7	6.	9 to 14	12.5
3 to 7	5.	5 to 9	7.	9 to 18	13.5
3 to 10	6.5	5 to 21	13.	10 to 15	12.5
4 to 5	4.5	6 to 7	6.5	10 to 17	13.5
4 to 5	4.5	6 to 10	8.	11 to 13	12.5

The average of the means in the above 21 instances is about eight and a half (8.42) days.

LENGTH OF TIME SCARLET FEVER PATIENTS SHOULD REMAIN ISOLATED.

Notwithstanding the subject is treated of in the pamphlet [110.] issued by the State Board of Health, letters of inquiry are often received at this office, regarding the length of time a scarlet fever patient should be isolated, or the premises placarded.

The placard should remain so long as there is, in the premises, contagium which may communicate the disease.

As mentioned in the pamphlet [110.], persons recovering from scarlet fever should not be liberated so long as any scaling or peeling of the skin continues, which sometimes is not completed before the lapse of seventy or eighty days. After recovery from scarlet fever, no person should appear in public wearing the same clothing worn while sick with or recovering from this disease, except such clothing has been thoroughly disinfected, and this without regard to time which has elapsed since recovery.

The following is a proposed form:

HEALTH OFFICER'S CERTIFICATE OF FREEDOM FROM LIABILITY TO COMMUNICATE SCARLET FEVER.

I hereby certify that...has
(Name.)
entirely recovered from scarlet fever, the date of recovery being.................................., 189..; that disinfection of the premises, where the disease has been, occurred.., 189..; that the period of desquamation ceased.., 189..; and that, after the peeling and scaling of the skin had ceased, the patient's clothing has been disinfected, ...namely, on.................., 189..; and that ..he is now free from liability to communicate scarlet fever, and is at liberty to attend school, church and public assemblies.

....
Health officer of the....................of....................
(Township, city or village.)
............................., Mich., ..., 189..

TYPHOID FEVER IN MICHIGAN

DURING THE YEAR ENDING DECEMBER 31, 1890.

There were reported to the office of the Secretary of the Michigan State Board of Health, during the year 1890, 1,924 cases of sickness, and 304 deaths from typhoid fever, in 310 localities. No reports of this disease were received from the following sixteen counties: Alcona, Alger, Arenac, Crawford, Gratiot, Iosco, Iron, Isle Royal, Luce, Mackinac, Manitou, Missaukee, Montmorency, Ogemaw, Presque Isle, Schoolcraft.

Table 1 gives, relative to typhoid fever, the number of outbreaks, localities, cases, and deaths, average number of cases per outbreak, average number of deaths per outbreak, per cent ratio of deaths to cases, and the number of special final reports received, for the seven years, 1884–90:

TABLE 1.—TYPHOID FEVER.—*Exhibiting the number of Outbreaks, Localities, Cases and Deaths reported for each of the seven years, 1884–90; also for some of those years the average Cases and Deaths per Outbreak, the per cent ratio of Deaths to Cases, and the number of Special Final reports received.*

Year.	Outbreaks Reported.	Localities Reported.	Cases Reported.	Deaths Reported.	Average Cases per Outbreak.	Average Deaths per Outbreak.	Deaths per 100 Cases.	Final Reports Received.
1884......	....	245	969	290	....	....	27	....
1885......	218	200	715	194	3.28	.89	23	....
1886......	290	282	1,194	282	4.15	.75	18	60
1887......	335	320	3,424	411	*7.24	*1.23	17	46
1888......	316	296	1,511	310	4.78	.98	21	60
1889......	482	398	2,530	402	†5.17	†.98	†18	115
1890......	330	310	1,924	304	5.83	.92	16	135

* The large average number of cases and deaths per outbreak in 1887 is partially accounted for by the fact that in two outbreaks the disease became epidemic, resulting in an aggregate of 535 cases and 72 deaths.

† In computing the average numbers of cases and deaths per outbreak, and the per cent ratio of deaths to cases in 1889, the outbreak at Negaunee, in which 300 cases were reported, is omitted, because the number of deaths which occurred in that outbreak was not reported.

As shown in Table 1 there were reported to this office 606 cases and 98 deaths less for the year 1890 than for the preceding year. The average number of cases per outbreak for the year 1890 is slightly more than for 1889. This is explained in part by the fact that, during the year 1889, there occurred an epidemic of this disease, at Negaunee, with 300 cases, which, as stated in the (†) foot-note to Table 1, were not computed in the average for that year.

The reports received at this office show this disease to have been slightly less fatal during the present year than for the preceding year, the number of fatal cases being 2 per cent (of the total number of cases) less in 1890 than in 1889.

In 1889 the number of reported cases per 10,000 of population was 12.4, in 1890 it was only 9.2.

Notwithstanding the large decrease in the number of reported outbreaks of this disease in 1890, as compared with 1889, there is shown by Table 1, an increase in the number of final reports received at this office relative to those outbreaks. This indicates a gratifying increase of assiduity on the part of local health officials in the discharge of their duties.

Study of the regular sickness-statistics in Michigan (conclusions from which are given in Exhibit 1 and Table 8, further on in this article) shows a decrease in the per cent of weekly reports which stated the presence of typhoid fever in 1890, as compared with 1889, which is corroborative of the evidence of the decrease in prevalence of the disease as shown (in Table 1 and the last three preceding paragraphs) by the system of communicable disease reports on which the first part of this article is based.

SOURCE OF CONTAGIUM OF TYPHOID FEVER.

TABLE 2.—*Exhibiting the reported "Source of Contagium" of Typhoid Fever in Michigan, during the year 1890.*

Reported Source of Contagium.	Number of Reports for each Source of Contagium.
Infected and impure water	54
Supposed to be impure water	5
Unsanitary surroundings	13
Defective drainage and sewers	3
From a former case	7
From outside jurisdiction whence reported	47
Decaying vegetables in cellar	2
Overwork	4
Digging a ditch	1
Unknown	68
No source stated	111
Sporadic	7
Exposure	5
Bad atmosphere	1
In milk	1
By working on Port Huron tunnel	1
All outbreaks	330

Table 2 shows that relative to 111 of the 330 outbreaks of typhoid fever reported to this office during the year 1890, the source of contagium was not stated, that in regard to 68 outbreaks it was reported as "unknown," and that in 47 instances it was reported as having been brought from outside the jurisdictions whence the outbreaks were reported. In 52 per cent of the remaining 104 outbreaks the source of contagium was given as "infected and impure water," and in 13 per cent as "supposed to be impure water."

Below are given extracts from statements found in the reports of local health officers with regard to the source of the contagium of typhoid fever.

"Most probably the use of water from a shallow creek to which geese, dogs, cats, cows, horses, men, women and children, both dead and alive, have free access."—*Geo. G. Barnett, M. D., Health Officer of Tilden township, Marquette county.*

"Investigating the source of this outbreak of Typhoid Fever, I found the well under the house, dug well, stoned up, about two feet of filthy water containing dead rats, sow bugs and filth from scrubbing floors. Hog yard, hen park and privy all within fifty to seventy-five feet of the well."—*H. C. Maynard, Health Officer of the Village of Hartford, Van Buren county.*

"From filth of cistern and reservoir, under the dwelling house, large enough to contain water for the use of 500 cattle in time of a drouth."—*Alexander C. Kidd, Health Officer, Albee township, Saginaw county.*

"This patient contracted the disease while engaged as a sailor. The vessel on which he was working lay in Detroit at the outlet of a sewer. He drank of the water."—*W. K. Moore, Health Officer, Algonac, St. Clair county.*

"This fever has prevailed here every year during the summer and autumn for the past six years, and very little, if anything has been done to prevent the ravages of the disease. Much of the land in and around about the town is low and swampy and the drainage and natural water courses are blocked up with slabs and saw dust along the whole front of the town. Water is obtained from two sources, water pipes in L'Anse Bay, and surface wells. The water pipes draw water from the bottom of a shallow bay, only a short distance from the shore, directly in front of two saw mills, and only a few feet from large docks built of mill waste. In summer the water always has a bad odor. As to the wells, water can be obtained anywhere by digging a few feet. After a heavy rain wells and shallow privy vaults are running over so that pollution of the well water is very general; and this is increased by lack of drainage."—*A. J. Braden, Health Officer, Baraga township, Baraga county.*

The following diagram, on page 212, drawn from sketches and information furnished by Mr. Braden, illustrates the conditions under which the water-supply of Baraga is obtained; which conditions seem to fully warrant the opinion that the source of the disease in Baraga was polluted drinking water.

TYPHOID FEVER AT SAULT STE. MARIE.

The following correspondence between the Secretary of this Board and Dr. A. J. Campbell, health officer of Sault Ste. Marie, bears on the source of contagium, and history, of an outbreak of typhoid fever which prevailed at that place from August to October, 1890, and which resulted in 300 cases of sickness and 20 deaths. It also illustrates some of the difficulties with which health officers have to contend in their efforts to restrict and stamp out dangerous communicable diseases which appear in their jurisdictions.

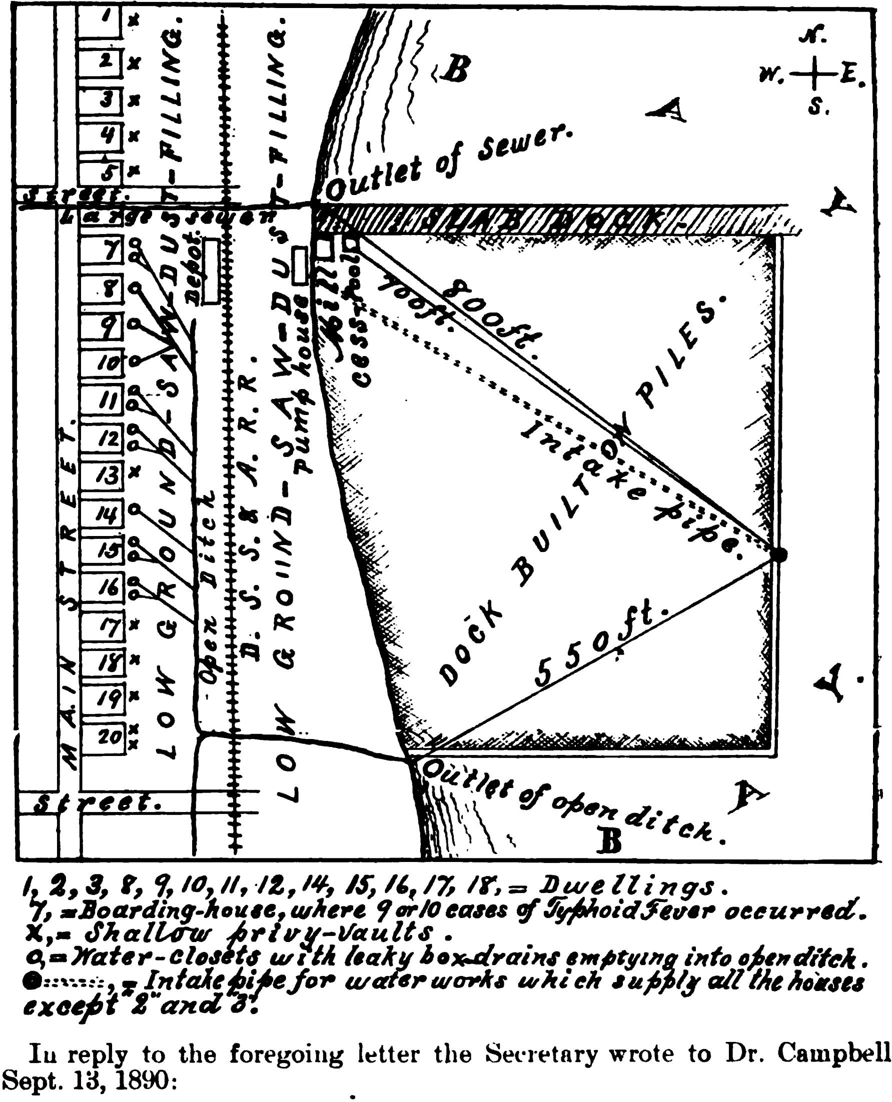
August 28, 1890, Dr. Campbell wrote to the Secretary as follows:

"I forward you a notice of an outbreak of typhoid fever. I will send you a fuller report soon. The physicians *will not* report. The prosecuting attorney will not prosecute for want of evidence. I can go and diagnose typhoid fever; the physician in attendance says no. I'll get three to say yes; he will get six to say no. The prosecuting attorney says, no evidence. Your health officer is ignominiously defeated. No remedy. My salary is $13.33 per month. Who can attend to his duty under such circumstances. I wish I had the power to get others to do their duty, and I would not mind it so much. I would like to hear from you in regard to the matter. I have the law; but I cannot get the prosecuting attorney to act.

* * * * * * * * * *

"Send a few of 'The Prevention of Typhoid Fever.'"

Plat of a portion of the Village of Baraga, Michigan.
Showing unsatisfactory location of water intake.



1, 2, 3, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, = Dwellings.
7, =Boarding-house, where 9 or 10 cases of Typhoid Fever occurred.
X, = Shallow privy-vaults.
o, = Water-closets with leaky box-drains emptying into open ditch.
●::::::, = Intake pipe for water works which supply all the houses except "2" and "3".

In reply to the foregoing letter the Secretary wrote to Dr. Campbell, Sept. 13, 1890:

"I have mailed to your address 40 documents on "The Prevention of Typhoid Fever," for distribution among those in your city who are in danger.

"I also sent you several copies of a document on 'Typhoid and Typho-Malarial Fevers' (a copy of which I herewith enclose) which it would probably be well for you to distribute among the practicing physicians in your jurisdiction.

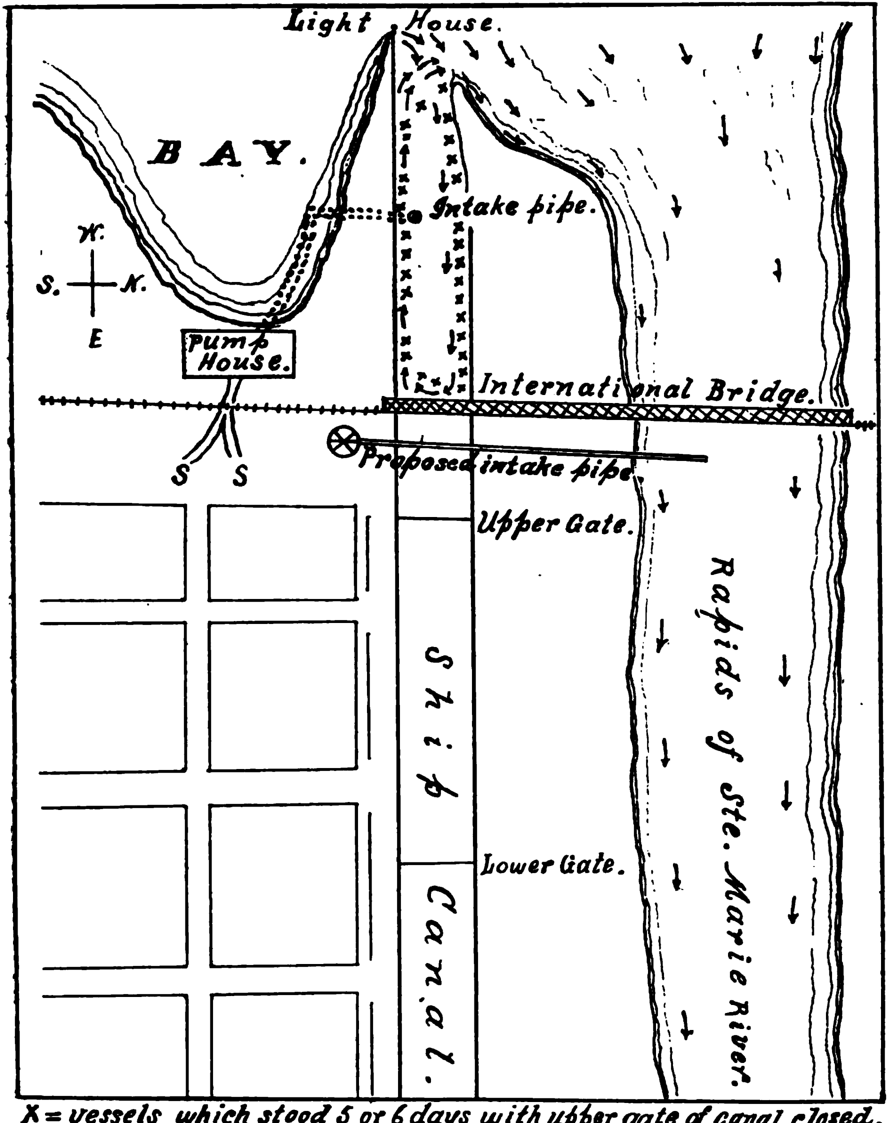
"I trust that your local board of health will vigorously endeavor to stamp out typhoid fever in your city."

November 18, 1890, the Secretary again wrote to Dr. Campbell as follows:

"Will you kindly send me all the information you can concerning the outbreak (in August) of typhoid fever in your city, and *its relations to the detention of boats*, etc.?

"I will also be glad to receive your final report of the outbreak when it is over."

Plan of a part of the City of Sault Ste. Marie



X = vessels which stood 5 or 6 days with upper gate of canal closed.
Arrows show current of water in canal when the upper gate is closed.
Map of conditions in Sault Ste. Marie, Michigan, where an outbreak of typhoid fever occurred. Water for domestic purposes was used from the canal when a large number of vessels were detained five or six days with canal closed while the locks were being repaired. During that time garbage and fæcal matter were continually thrown into the canal from these vessels.

In reply to the last preceding letter, Dr. Campbell wrote:

"In compliance to your request regarding the history of the typhoid fever outbreak in the city of Sault Ste. Marie last summer: The fever made its appearance immediately after the canal locks were repaired. In my monthly report to our city council I called attention to the impurities of the water used for domestic purposes during the time the canal was closed, and when between three and four hundred vessels were detained during the space of five or six days. We sent samples of water to Dr. Vaughan, Michigan University, for analyses. He discovered disease germs—typhoid fever germ, and having collected the poison from the specimen sent, injected, hypodermically, the same into the abdomen of a rat, result, death. One month after the fever began to abate, I sent specimens from the cataract pump house, and from a tap in the most distant point from the pump house, marking them Nos. 1, 2 and 3,—result, pure, no disease germ, no poison.

"I enclose you a diagram of the water works, or pump house, cataract and canal. There were about three hundred cases of typhoid and typho-malarial fevers; probably 20 deaths. The fever began about two weeks after the canal was opened. First case reported to me in August, the last on the 20th October.

"I trust the State Board of Health will urge, with effect, the propriety of every town and city having a board of health. The council too often are under political obligations that bind them hand and foot."

"The water in the bay where the pump house is situated is almost dead water. The intake pipe runs through the south pier of the canal into the canal. You will observe the indication of the course of the water. The current runs into the rapids past the canal; but a small current runs into the canal and turns back if the upper gate is closed, and catches the current running into the rapids. x x x x show where the vessels were standing for five days dumping out diseased garbage and fæcal discharges while the locks were being repaired. The water thus saturated was taken by the intake pipe and thus supplying the city by way of S. S. I recommended carrying the intake pipe (to be carried from a pump house erected at ⊕) to the center of the rapids, and be no longer at the mercy of an accident on the canal locks."

In thanking Dr. Campbell for his report, as given above, the Secretary wrote:

"In reference to the intake of the water-supply of your city, how would it do to place it beyond the light house, in the river, just above where it could receive any water from the canal? If below the bridge it would still take in some water which came from the canal."

Following are a diagram (drawn in this office from the one referred to in the above letter) and explanations thereof, given by Dr. Campbell, which graphically portray the conditions under which the water supply of Sault Ste. Marie, believed to have been the cause of the outbreak of typhoid fever there, was obtained:

TYPHOID FEVER IN HARTFORD, VAN BUREN COUNTY.

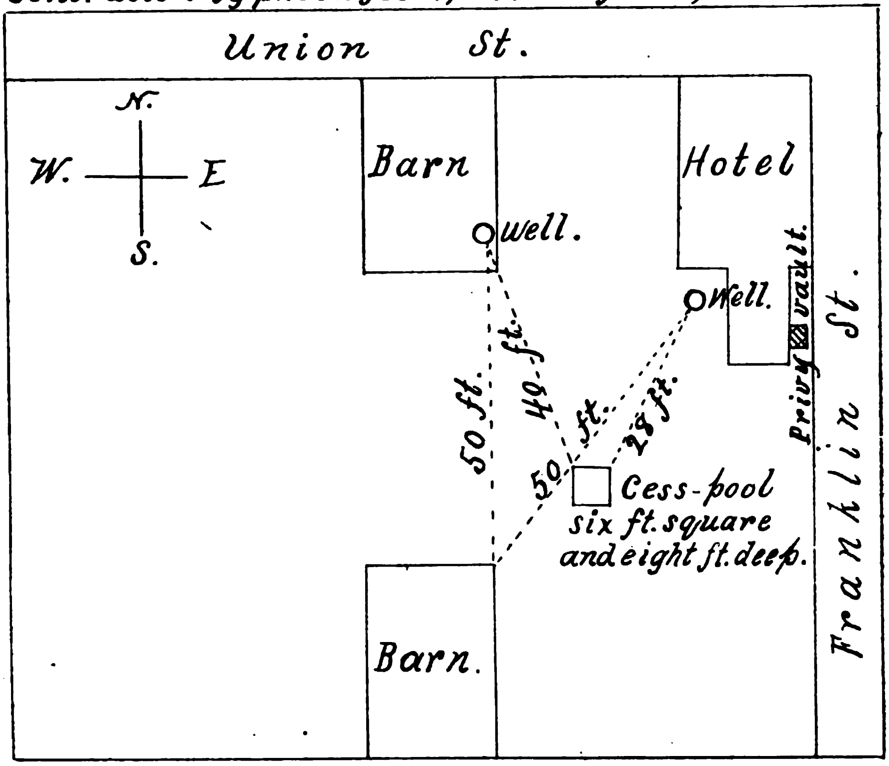
Relative to an outbreak of typhoid fever in the village of Hartford, of which the source of contagium was believed to be impure drinking water, Dr. H. C. Maynard, health officer of the village, wrote to this office as follows:

"The case of typhoid fever reported, is a young man that has been boarding at the principal hotel of this village all summer. I procured and tested the water furnished the guests of the house and find it a mass of organic matter.

"I send you diagram of the water supply."

Following is a diagram made in this office, from the one referred to in Dr. Maynard's letter.

Impure source of water used by person who contracted typhoid fever, in Hartford, Mich.



INFECTED MILK THE SUPPOSED CAUSE OF TYPHOID FEVER IN WYANDOTTE.

Sept. 28, 1890, Dr. E. P. Christian, of Wyandotte, Wayne county, wrote to the Secretary of this Board relative to typhoid fever in that city as follows:—

> "Typhoid fever has been with us this fall unusually prevalent and of more than common severity. This is rather severe on the doctors of our city who advocated getting in water works as a sanitary measure in this respect. We had the river water introduced a year ago this fall, and to have had such an increase in number and severity of cases since its introduction has led to the surmise that we had been introducing to our houses the diluted sewage of Detroit. Perhaps this is so to some extent, for the solid parts no doubt settle to the bottom all along down, and when a heavy wind prevails the water from the penstocks is at times decidedly roily and off color.
>
> "However, the fact is that the disease has prevailed as to numbers, about equally among users of well water and of river water—giving rise to the suggestion that we must look elsewhere for the cause of the disease than in the drinking water.
>
> "This I have suspected for a long time and have had a suspicion that this cause was in the milk.
>
> "I have had an experience within the past two months which has strengthened that suspicion.
>
> "In the family of Mr. A. two cases of enteric fever, and all the family ailing—in the family of T. three (3) cases and others ailing, one deceased. In the family of Mrs. F., one severe case—all these in immediate neighborhood—all it is true using river water, but all getting milk from one cow, a neighbor's—also in Dr. C.'s practice in family of Mr. T., one case getting milk from same cow, but also using river water. This animal is stall-fed, kept up in barn. To be sure there have been many other cases of fever in those using well water and milk from other sources. But is it not singular that so many cases have occurred in one small neighborhood and all getting milk from the same animal?
>
> "It would be worth while for the Board of Health to purchase this animal and investigate her."

Sept. 30, 1890, the Secretary sent to each member of this Board a copy of Dr. Christian's letter accompanied by the following from himself:—

"Dear Sir:—I shall be glad to receive any suggestions which you will make on the subject of the above letter from Dr. Christian."

Samples of the milk, of the river water, and of the well water were sent to Prof. Vaughan, Director of the Laboratory of Hygiene, Ann Arbor; and at the meeting of this Board Oct. 14, 1890, he made a verbal preliminary report that bacteriological examination revealed the fact that both of the samples of water and the milk contained micro-organisms which, by their life processes, in nutritive solutions, form poisons.

At the same meeting Drs. Vaughan and Kellogg were appointed a committee to further investigate this subject; and later, Dr. Vaughan reported as follows relative to analyses of waters and milk sent to him from Wyandotte:

MICHIGAN UNIVERSITY—LABORATORY OF HYGIENE.

Report of the Sanitary Condition of Water sent by E. P. Christian, M. D., Wyandotte, Michigan:

Source of water, with remarks on the sanitary surroundings.

No. I.—From H. Millspaugh's well. No. II.—From Water Works.

PHYSICAL PROPERTIES.

	No. I.	No. II.
Color	Sedimentary	Clear.
Odor	None	None.
Reaction	Neutral	Neutral.
Hardness	18	7 (Clark's Scale.)

Chemical Analysis (Parts per Million.)

(1)	Total residue obtained by evaporation at 110 C	1090.	221.
(2)	Residue after ignition, or inorganic matter in residue	850.	191.
(3)	Organic residue, or loss on ignition	240.	30.
(4)	Amount of earthy bases, calculated as oxides	20.798	10.976
(5)	Amount of chlorine, calculated as sodium chloride	266.4	49.5
(6)	Amount of sulphates calculated as SO_3	Strong trace	None.
(7)	Parts of potassium permanganate reduced by the organic matter in the water	41.06	32.548
(8)	Amount of free ammonia	0.46	0.08
(9)	Amount of albuminoid ammonia	0.56	0.52
(10)	Amount of nitrates, calculated as N_2O_5	13.06	0.653
(11)	Amount of nitrites, calculated as N_2O_3	0.247	0.0082

* * * * * * * * *

Microscopical Examination.—Description of deposit, magnified 100 diameters. No. I. Crystals. Yellow amorphous matter. White amorphous matter. No. II. Crystals. Algæ. Yellow amorphous matter. White amorphous matter. Same magnified 500 diameters. No. I. Sodium chloride crystals. Algæ. Yellow amorphous matter. White amorphous matter. No. II. Sodium chloride crystals. Silica. Fibres. Algæ. Vorticellæ. Yellow amorphous matter. White amorphous matter.

Bacteriological Examination.—Number of germs developed on a gelatin plate inoculated with one drop of water:

	No. I.	No. II.	Milk.
(1) After 24 hours	2430	1770	3460
(2) After 48 hours	2580	1890	3460
(3) After 72 hours	2580	1890	3460

Remarks on the Kinds of Germs Observed.—In No. I. are two kinds of germs: (a) the green bacillus of water, and (b) a non-liquifying toxicogenic germ. In No. II. are two kinds of germs: (a) the green bacillus of water, and (b) a liquifying toxicogenic germ. In the milk there are three or four kinds of germs, among which there is the same non-liquifying toxicogenic germ found in the well water.

Inoculation Experiments.—Kind of animal inoculated with the germs: Rats. Method of inoculation: By injection into the peritonial cavity. Kind, amount, and age of culture used: Twenty drops of a beef-tea culture 24 hours old. Results of the inoculation: Death with all the samples. Post-mortem appearances: These were practically the same with all samples, and consisted of engorgement of the spleen, the mesenteric glands, liver and kidney. Description of the germs, if any, found in the organs: The toxicogenic germs found in the waters and in the milk were also found in the organs of the animals. In what organs were the germs, if any, found growing? Spleen, liver and kidney.

Explanation.—One drop of the water is added to one drachm of some culture medium, such as beef-tea, and this, after it has been kept at the temperature of the body for 24 hours or longer, is used for inoculating animals.

Conclusions.—I regard both the waters and the milk unsafe. Of the two waters, that from the well is the worse both chemically and bacteriologically. The milk was examined only bacteriologically. The poison-producing germ in the well water is identical with that in the milk. I am inclined to the opinion that if the typhoid fever was due to one of the waters, the well water is the one more likely to be the cause. Eberth's germ (the so-called typhoid germ) was not found in any of the samples. This, however, does not mean, in my opinion, that the waters would not cause the typhoid fever. I have never yet found Eberth's germ in drinking water (with one possible exception). The river water probably has changed in its character since the sample was taken, but the well water certainly should not be used.

V. C. VAUGHAN,

Director of the Michigan State Laboratory of Hygiene.

Ann Arbor, Nov. 12, 1890.

TABLE 3.—*Exhibiting the Localities from which Typhoid Fever was spread (according to the official reports), with the number of Cases and Deaths, if reported; the Secondary Localities into which the Disease was said to have been Introduced from the First (with number of Cases and Deaths.) Compiled from Reports by Health Officers who were able to trace the source of Contagium to other Localities.*

First Localities from which Typhoid Fever Spread.	In "First" Localities.		Secondary Localities infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
Antrim county: Torch Lake township	6	2	Antrim county: Central Lake township	9	0
Baraga county: Pequaming, L'Anse township	*	------	Houghton county: Lake Linden village	4	1
Berrien county: Berrien Springs village	*	------	Berrien county: Berrien township	3	0
Calhoun county: Battle Creek city	5	2	Calhoun county: Beford township	1	0
			Barry county: Barry township	2	0
Cass county: Dowagic city	8	0	Van Buren county: Keeler township	1	0
Emmet county: Petoskey village	*	------	Lenawee county: Morenci village	1	0
Gogebic county: Bessemer city	*	------	Ontonagon county: Rockland township	1	0
Hillsdale county: North Adams township	*	------	Jackson county: Liberty township	1	0
Houghton county: Calumet village	72	0	Ontonagon county: Rockland township	1	0
Ingham county: Stockbridge village	20	2	Ingham county: Danseville village	2	0
			Ingham township	1	1
Kent county: Grand Rapids city	193	30	Allegan county: Allegan township	2	0
			Kent county: Cannon township	3	0
			Cascade township	11	3
Leelanaw county: Empire township	1	0	Leelanaw county: Glen Arbor township	2	0
Lenawee county: Adrian city	9	2	Lenawee county: Dover township	3	0
Lenawee county: Rollin township	1	0	Lenawee county: Rome township	6	2
Mecosta county: Big Rapids city	29	2	Muskegon county: Muskegon city	15	5
Oscoda county	*	------	Sanilac county: Marion township	3	0
Presque Isle county	*	------	Cheboygan county: Tuscarora township	4	1
St. Clair county: St. Clair city	1	1	St. Clair county: Columbus township	1	0

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* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred. This shows neglect in the locality from which the disease spread.

TABLE 3.—CONCLUDED.—*Exhibiting the Localities from which Typhoid Fever was spread.*

First Localities from which Typhoid Fever Spread.	In "First" Localities.		Secondary Localities infected from "First."	In "Secondary" Localities.	
	Cases.	Deaths.		Cases.	Deaths.
St. Clair county: Port Huron city	*	------	Huron county: Verona township	4	0
Wayne county: Detroit city	39	10	Lenawee county: Morenci village	1	0
			Macomb county: Richmond village	1	0
			Romeo village	1	0
			Oakland county: Rose township	1	1
			Wayne county: Hamtramck township	9	2
Adjoining township	*	------	Saginaw county: Albee township	2	0
(*Outside the State.*)					
Canada	------	------	Tuscola county: Gilford township	1	0
Chicago	------	------	Kalamazoo county: Schoolcraft township	2	2
			Macomb county: Richmond village	1	0
Colorado	------	------	Shiawassee county: Perry township	1	1
Illinois	------	------	Hillsdale county: Ransom township	4	1
Burdick, Indiana	------	------	Lenawee county: Clayton village	3	0
Garrett, Indiana	------	------	Lenawee county: Morenci village	1	0
Montana	------	------	Livingston county: Deerfield township	1	0

* This outbreak was not reported to this office by the Health Officer of the "first" locality at the time it occurred. This shows neglect in the locality from which the disease spread.

In the following instance the contagium was reported to have been carried to a third locality:—

From Pequaming, L'Anse township, Baraga county to Lake Linden village, Houghton county, thence to Torch Lake township, Antrim county.

EFFORTS FOR THE PREVENTION AND RESTRICTION OF TYPHOID FEVER.

It is gratifying to note that the increased interest on the part of local health officers in carrying out the preventive and restrictive measures recommended by the State Board of Health in outbreaks of typhoid fever mentioned in the Annual Report of this Board for 1890, is again apparent this year, and that many of those officials have been very zealous in efforts to induce physicians to report cases of that disease occurring in their practice, to obtain amelioration of the water-supply in localities where typhoid fever has occurred, and in advocating the introduction of measures calculated to improve the sanitary conditions in their jurisdictions.

The following extracts from letters and reports received at this office illustrate the nature of the efforts made by those officials and show that those efforts are not always made under the most encouraging or favorable circumstances.

"I am doing all that I can in the way of disinfection of all bowel discharges, cleanliness, etc. and whenever I can prevail upon them to do so, I have all drinking water boiled. The population is largely foreign. There is very little public sentiment in favor of improvement, and only a small minority that will give any encouragement or coöperation in that direction."—*A. J. Braden, Health Officer, Baraga township, Baraga county.*

"Inclosed please find final report of those cases reported. They are all well and I have been able to make the owner of the house in which those cases were, understand that it was his duty to tear the house down. The house is old and is built on saw dust which has been there for years and which would surely cause some other troubles before long. I have found out that years ago, about four or five years, people living in the same house, died of a disease not recognized then, but which seems to me to be the same as the one reported as typho-malarial."—*Melville E. deLaval, M. D., Health Officer, Schoolcraft township, Houghton county.*

"Drains opened, cleaned and disinfected. Privy vaults cleaned. Cellars drained."—*A. J. Braden, Health Officer, Baraga township, Baraga county.*

"Your enclosed circular and other documents duly received. In reply would say that we have had eleven cases of fever in this location this year. The last case of which is now ready to be returned to his home. Our fever is cared for here in our hospital by experienced nurses, in a ward devoted exclusively to their use, where they are protected from officious friends. Their diet intelligently administered, the soiled clothing placed in disinfecting fluid on the same floor, the sputa received in sanitary cups and burned, the excreta received in disinfecting fluid and placed in barrels at remote points in disinfecting fluid, and, next month when frozen, removed beyond possible chance of communication. As the season seemed to be prolific with fever, we had in readiness a large hall, capable of holding fifty beds, should our hospital be overtaxed.

"Our reason for caring for our people in this manner is due to the fact, that since 1883 we have had no case of fever originate in our location. Previous to and including that date, fever was a common and constant visitor, in the latter year reaching eighty cases. Our mining officers with myself, drafted sanitary rules, the cleaning of wells, ordering garbage and slops placed in pits remote from the wells, the filling and disinfecting of vaults, the cleaning of cellars under the rigid daily inspection of a proper officer, as a means of purifying the ground surface and the protection of our water supply which is from the surface entirely. Every year from the interchange of employés coming from infected districts, we are the victims of transplantation of fever and for the avoidance of seed sowing, such cases are, as soon as discovered, removed where the details of restriction can be carefully carried out, and, from the fact that so far, in the time named, we can trace the neighboring point from which the patient came; and that we have yet to record a case as being infected from any extension of the disease, speaks plainly the result of the attention given it.

"We have no municipal organization here, all measures being under the control of the mining company, whose representatives are the township officers, and I cannot too highly compliment the manager and officers of the mining company for the intelligent and cheerful accord by which is made possible such sanitary and life-saving methods."—*I. Freund, M. D., Health Officer, Champion township, Marquette county.*

DIFFICULTIES EXPERIENCED BY LOCAL HEALTH OFFICERS IN RESTRICTING TYPHOID FEVER.

Some of the difficulties which local health officers experience in the performance of the duties required of them by law, are shown by the following extracts from correspondence of this office with those health officers in regard to typhoid fever:

Alvinza C. Merrill, M. D., Health Officer of Harbor Springs, Emmet county, reports, relative to an outbreak of typhoid fever, as follows:—

"The attending physician did not inform me, nor did he report the cases to me as he should have done."

In reply to the question "What exceptions were there to the complete accomplishment of the disinfection of excreta, boiling of water, etc.," in an outbreak of typhoid fever, N. D. Lee, M. D., Health Officer of Saginaw, West side, wrote:—

"None, when it was reported by a physician; but they do not report more than half the cases. I get more than half of the cases through newspapers, after they are dead or well."

F. M. Kerry, Health Officer of Benton Harbor, Berrien county, reported in regard to an outbreak of the disease:—

"Three families were reported by well founded rumor. In two of these deaths occurred. The physicians did not report cases. My attention would be called to the fact by rumor or funeral notice. Physicians claimed disease was typho-malarial or billious remittent fever.

"Have not had a case of typhoid reported to me by a physician."

N. B. Sherman, M. D., Health Officer, Waterloo township, Jackson county, reporting in regard to typhoid fever, wrote:—

"I have learned in a casual way of the death of Jas. Rowe, Mrs. Hall, and Henry Arty. The attending physicians were Dr. Rowe, of Stockbridge; Dr. Condon, Munith; Dr. Raymond, Grass Lake. These cases have not been reported to me. * * * * Possibly these Drs. before mentioned do not understand their duty."

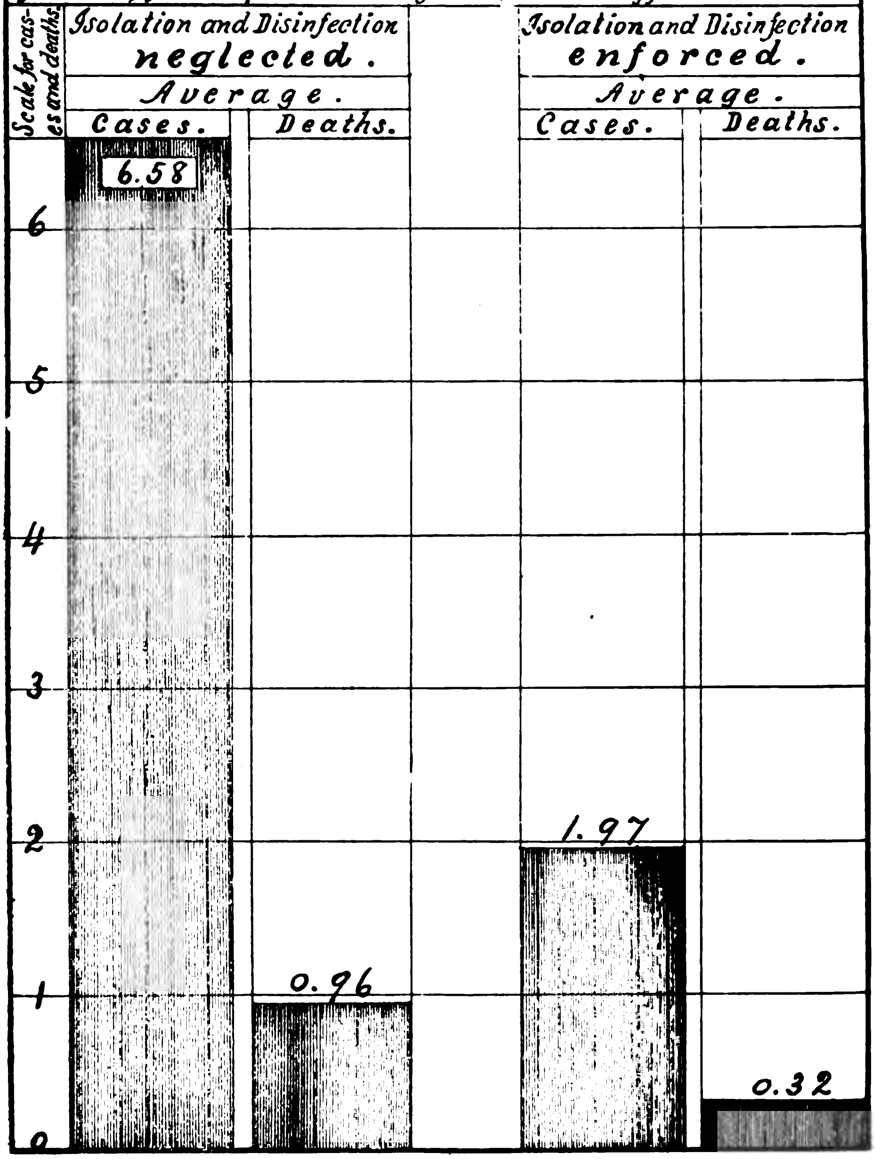
In studying the effects of efforts of health officers for the restriction and prevention of typhoid fever, and of the difficulties experienced by some of them in carrying out the methods recommended by the State Board of Health to that end; it is interesting to note the difference in the reported numbers of cases of sickness and of deaths, from this disease, in outbreaks where local health officers were enabled to enforce isolation and disinfection, and in those outbreaks in which, for any reason, those restrictive measures were neglected.

The diagram on page 222 graphically illustrates this difference, and shows that in outbreaks relative to which the reports state that isolation and disinfection were enforced, there occurred 1.97 cases and 0.32 of one death per outbreak; whereas in those outbreaks where isolation and disinfection were neglected, there were 6.58 cases of sickness and 0.96 of one death per outbreak; or about three times as many cases and deaths in outbreaks in which isolation and disinfection were neglected, as there were in outbreaks where those restrictive measures were enforced. It therefore seems probable that if proper restrictive measures had been adopted in all the 330 outbreaks of this disease which were reported to this office during the year, with results similar to those obtained in the above-mentioned outbreaks where isolation and disinfection were enforced (1.97 cases and 0.32 of one death per outbreak), there would have occurred only 650 cases of sickness and 106 deaths from this disease in the State during the year, instead of the 1,924 cases and 304 deaths which actually occurred in those outbreaks which were reported; and a saving to the State of 1,274 cases of sickness and 198 lives would have been effected.

This showing seems to present a forcible argument in favor of the adoption of the preventive measures above referred to, and a strong plea for the coöperation of all the people, in the efforts of health officers to stamp out this preventable disease.

ISOLATION AND DISINFECTION RESTRICT TYPHOID FEVER.

Typhoid Fever in Michigan in 1890:—Exhibiting the average numbers of cases and deaths per outbreak:—in all outbreaks in which Isolation and Disinfection were both neglected; and in all outbreaks in which both were enforced.* (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



*Including the disinfection of the bowel discharges of the patients.

AVERAGE DURATION OF TYPHOID FEVER.—FATAL AND NON-FATAL CASES.

TABLE 4.—*Exhibiting by Sex of patient, the. Average Duration (in days) of Fatal cases of sickness from Typhoid Fever, in Michigan, during the four years, and during each of the four years 1887–90. (Compiled from those reports which stated the length of time the patient was sick.)*

Year.	Fatal cases of Typhoid Fever.	No. of cases included in this table.	Duration of Sickness:—Per cent of Deaths in each Period of Days.											
			All cases.	Under 10 days.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 Days and over.
1887.	Males	81	100	10	7	15	21	16	11	12	2	4	1	0
	Females	32	100	31	19	19	16	6	3	0	0	6	0	0
1888.	Males	40	100	20	13	18	23	10	8	0	5	3	3	0
	Females	33	100	24	21	15	12	9	6	3	0	0	9	0
1889.	Males	42	100	17	14	19	7	14	5	7	2	7	0	7
	Females	51	100	18	24	14	16	10	2	6	2	2	0	8
1890.	Males	57	100	19	9	21	23	5	5	7	0	4	2	5
	Females	26	100	19	23	8	8	19	12	0	8	0	0	4
Av. 1887–90.	Males	220	100	17	11	18	19	11	7	5	2	5	2	3
	Females	142	100	23	22	14	13	11	6	2	3	2	2	3

From Table 4 it may be seen that of the 220 males who were reported to have died from typhoid fever within the four years 1887–90, and of which the interval between the day of being taken sick and day of death was given, the largest per cent died in the two periods from the 15th to the 20th and from the 20th to the 25th day of sickness, and that 54 per cent were sick twenty or more days before they died; while of the 142 females reported as having died in the same time, 23 per cent died before the tenth day, and that only 42 per cent were sick longer than nineteen days.

The average duration for the fatal cases, was in males 22.4 days, and in females 20 days.

In Table 5 it may be noticed that the duration of sickness in *non-fatal* cases of typhoid fever for the four years, 1887–90, was about the same for both sexes; 62 per cent of the males and 64 per cent of the females recovered before the thirty-fifth day of sickness. The average duration was:—males 32.8 days, females 31.5 days.

The average duration of all cases, fatal and non-fatal, was:—males, 27.6 days, females, 25.8 days; and for all cases of both sexes, 26.87 days.

TABLE 5.—*Exhibiting by Sex of patient, by per cent of cases which recovered in specified periods of time, the average duration (in days) of non-fatal cases of sickness from Typhoid fever, in Michigan, during the four years and during each of the four years 1887-90. (Compiled from those reports which stated the length of time the patient was sick.)*

Year.	Non-Fatal Cases of Typhoid Fever.	No. of cases included in this table.	Duration of Sickness:—Per Cent of Cases in each Period of Days.										
			All Periods.	Under 10 Days.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 Days and over.
1887.	Males	203	100	0	5	6	12	16	18	15	9	6	3	8
	Females	158	100	0	9	9	19	12	17	11	6	4	3	9
1888.	Males	164	100	1	4	13	9	18	15	9	10	9	9	7
	Females	111	100	0	2	7	14	15	15	19	4	8	10	8
1889.	Males	166	100	2	7	13	14	16	14	12	9	6	2	5
	Females	165	100	6	8	9	14	19	12	11	8	4	2	7
1890.	Males	226	100	1	4	7	15	18	19	12	10	5	2	8
	Females	110	100	1	4	14	16	17	13	14	9	2	5	6
Av. 1887-90.	Males	759	100	1	5	10	13	16	17	12	10	7	4	7
	Females	544	100	2	6	10	16	16	14	14	7	5	5	8

TABLE 6.—*Exhibiting, by Sex of patient, the Age of persons reported sick from Typhoid Fever, in Michigan, during each of the four years, 1887-90, and the averages for the four years. Also the Average Age, and the Number of cases, in which the age was stated, reported in each of the four years. (Compiled from reports of those cases in which the Age was stated.)*

Year.	Sickness from Typhoid Fever.	Average age. Years.	No. of cases included in this table.	Age,—In periods of Years. Per Cent of Cases in each Period of Age.										
				All Ages.	Under 10 years.	10 to 15.	15 to 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 Years and over.
1887.	Males	24	316	100	10	10	14	20	17	9	8	4	2	4
	Females	22	245	100	17	10	20	15	10	10	5	4	3	5
1888.	Males	24	310	100	12	13	15	20	11	11	5	4	3	6
	Females	28	199	100	12	22	20	14	8	5	4	6	3	7
1889.	Males	24	362	100	13	11	17	25	10	8	6	3	2	6
	Females	23	310	100	16	17	20	12	8	7	7	4	4	5
1890.	Males	22	325	100	14	12	16	25	16	7	4	3	2	3
	Females	20	199	100	16	16	24	17	11	6	5	1	2	4
Av. 1887-90.	Males	24	1,313	100	12	12	16	23	14	9	6	4	2	5
	Females	22	953	100	15	16	21	15	9	7	5	4	3	5

AGE OF OCCURRENCE OF TYPHOID FEVER.

In studying table 6 relative to age of persons who have typhoid fever, it should be borne in mind that there are more persons living at the earlier ages than at the more advanced ages. After the publication of the census of 1890, it will be possible to compare this table with one exhibiting the per cent of persons living in each period of age, and thus complete the study here provided for by this statement of facts relative to nearly two thousand three hundred cases of typhoid fever.

TWO LINES OF EVIDENCE OF THE PREVALENCE OF TYPHOID FEVER.

In studying the prevalence of typhoid fever in 1890, from the facts presented in the preceding and following pages, it must be borne in mind that those facts are derived from two distinct sources of information:

1.—The numbers of outbreaks, of cases of sickness, and of deaths from typhoid fever are taken from special reports from health officers and other township, city and village officers, during the course of an outbreak, at its close, or in special reports at the close of the year. If all the people and officers reported as the laws provide, the facts presented would represent the *actual numbers* of outbreaks, cases of sickness, and deaths from typhoid fever which occurred in the State during the year; but *all* do not so report. It is just, however, to state that, as the people generally are becoming better instructed in the measures recommended by the State Board of Health for the saving of life and health, better and more complete reports are made year by year. So, each year, we believe that an increasing proportion of the cases of sickness and deaths from the dangerous communicable diseases are reported to this office. This tends towards an apparent increase in the prevalence of the disease each year, modified, of course, by the real fluctuation in prevalence. While waiting for perfect reports, the facts derived from those now received are valuable for purposes of study.

2.—The prevalence of typhoid fever, or of any given disease, as indicated by the "per cent of reports" is taken from the weekly postal-card reports from regular correspondents of the State Board, health officers of cities and villages, and others. The "per cent of reports" is the per cent of the whole number of reports received which stated the presence of the disease named; it gives the relative prevalence of the disease, under the observation of the physicians who report. It may represent the relative area of prevalence of the disease, combined with the relative number of weeks the disease continued where it did occur, *but not the actual number of cases.*

TABLE 7.—*Exhibiting the number of Inches of Earth above the ground water in Lansing, by months for the years 1886–90, compared with the per cent of reported cases and outbreaks of Typhoid Fever in Michigan, for each month; also the total number of cases and outbreaks reported for those years. (Compiled from those cases of which the date of occurrence was given; and from those outbreaks of which the time of beginning was stated.)*

Specifications relative to ground water and Typhoid fever.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	No. of cases and outbreaks included in this table.
Inches of earth above the water, year 1886	......	276	278	274	272	273	277	282	287	287	288	291	294	....
Per cent of cases of typhoid fever reported, year 1886 *	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Per cent of outbreaks which began in each month, 1886	100	6	4	4	2	2	4	11	15	26	11	11	5	253
Inches of earth above the water, year 1887	......	296	287	280	282	285	288	290	291	291	294	297	294	....
Per cent of cases of typhoid fever reported, year 1887	100	2	1	1	1	2	3	8	20	24	19	12	7	1,098
Per cent of outbreaks which began in each month, 1887	100	5	2	2	3	6	4	12	23	20	11	9	3	289
Inches of earth above the water, year 1888	......	292	298	294	298	298	298	293	290	293	297	294	300	....
Per cent of cases of typhoid fever reported, year 1888	100	5	3	2	3	3	4	7	13	18	23	11	9	609
Per cent of outbreaks which began in each month, 1888	100	7	5	3	3	4	6	12	15	16	15	6	7	205
Inches of earth above the water, year 1889	......	298	304	304	302	304	299	299	302	305	308	311	312	....
Per cent of cases of typhoid fever reported, year 1889	100	1	2	1	2	1	2	4	12	28	24	15	7	1,248
Per cent of outbreaks which began in each month, 1889	100	4	2	3	2	2	5	8	17	21	19	11	6	382
Inches of earth above the water, year 1890	......	309	307	305	302	296	292	293	295	300	300	298	300	....
Per cent of cases of typhoid fever reported, year 1890	100	5	2	2	3	2	2	7	23	18	17	12	6	1,089
Per cent of outbreaks which began in each month, 1890	100	5	4	3	3	6	5	9	25	13	15	6	5	253

* The per cent of cases in each month was not computed in 1886.

The weekly card reports, however, furnish a valuable means of ascertaining, approximately, the relative prevalence of the several diseases in a given year, and the relative prevalence of a given disease in one year compared with other years, and it is as good a scheme for ascertaining the facts as is yet available. Therefore the sickness statistics based upon those weekly card-reports should be relied upon for a comparison of the relative prevalence of typhoid fever in 1890 compared with preceding years. However, the evidence from the two sources may well be compared.

A comparison of the evidence from the two sources, just mentioned, relative to typhoid fever during the years 1886–90, is facilitated by the following Exhibit 1:—

Exhibit 1.—*By years for the Six Years 1885-90, the Per cent of Reports (from regular correspondents to the State Board of Health, and others) Stating the Presence of Typhoid Fever in Michigan, also the numbers of Outbreaks, numbers of Localities of Outbreaks, the Cases of Sickness and the Deaths from Typhoid Fever for the Same Years.*

Years.	Per cent of Weekly postal Reports Stating the Presence of Typhoid fever.	Reported Outbreaks of Typhoid fever.	Reported Localities of Outbreaks of Typhoid fever.	Reported Cases of Sickness from Typhoid fever.	Reported Deaths from Typhoid fever.
1885	8	218	200	715	194
1886	8	290	282	1,194	282
1887	10	335	320	2,424	411
1888	10	316	296	*1,511	310
1889	10	432	398	2,530	402
1890	8	330	310	1,924	304

* Inasmuch as it appears that the reported outbreaks and localities in which typhoid fever occurred in 1888 were not very much less than in the preceding year, and were even more than in the year 1886, it is possible that in 1888, the outbreaks of typhoid fever were not allowed to spread as much as in previous years.

THE RELATION OF SICKNESS FROM TYPHOID FEVER TO THE RAINFALL, TO THE GROUND WATER,† AND TO THE HEIGHT OF THE WATER IN WELLS, IN MICHIGAN.

Typhoid fever differs in its mode of spread from some of the other dangerous communicable diseases. It is now most generally believed to be spread by a specific "germ," which is reproduced in the intestines, being conveyed from the bowel discharges of a victim of the disease to the alimentary canal of the second victim. Probably the most usual mode of conveyance for these "germs" is the contamination of the water-supplies by the fecal matter from those sick with this disease. The contamination of the water-supplies, and the virulence of the infected water seem to depend largely on the amount of rainfall and the consequent amount of water in wells which supply water for culinary and drinking purposes. A discussion of this subject from the evidence then collected, was printed in the Report of this Board for the year 1884, pages 88–114. Further evidence has been collected and is presented in the following tables.

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† It now appears that the fluctuations in the level of the water in the wells from which water is drawn daily are not the same as in wells from which no water is drawn, and which, therefore show more accurately the level of the ground water.

TABLE 8.—TYPHOID FEVER IN MICHIGAN.—*Average per cent of weekly card-reports stating the presence of Typhoid Fever, by year and Months for the Ten years, 1878–87, also in each of the six years, 1885–90.*

Period of Time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878–87*	12	10	9	7	5	5	5	7	14	20	22	20	14
1885	†6	11	7	5	4	3	5	5	6	11	13	16	8
1886	†8	6	8	4	3	5	4	5	13	16	16	13	10
1887*	10	6	10	4	3	3	4	8	14	22	18	15	11
1888	10	10	7	6	5	4	5	7	12	18	16	12	10
1889	10	8	5	3	3	4	5	5	12	19	25	19	12
1890	8	6	1	2	2	2	5	6	15	15	16	13	7

* The figures in the line for 1887, and in the line for the average for the ten years 1878–87, in this table do not all exactly agree with those in the same lines in the table printed on page lvi, of the Report of this Board for the year 1888, for the reason that the table printed in the Report for 1888 was made before the cards were all compiled for the *year* and was taken from the compilation (of the card reports first received) for the quarterly reports. The line "Average 10 years 1878–87," included the data for the year 1887 and consequently is not exactly, although it is substantially, the same as in the above table.

† Since May, 1885, physicians have reported only the prevalence of diseases under their *own observation*. Previous to that time diseases which were *believed* to be present (under the care of other physicians) were so reported. This undoubtedly accounts for a part of the sudden decrease in 1885 and 1886 as compared with the preceding years.

Table 8 exhibits the average prevalence of typhoid fever in Michigan by year and months for the ten years 1878–87, and for each of the six years, 1885–90, as indicated by the weekly card reports made by regular observers. Table 9 exhibits the rainfall by months and years for the period of ten years, 1878–87, and for each of the six years 1885–90.

TABLE 9.—RAINFALL IN MICHIGAN.—*Average number of Inches, by Months, for the Ten Years 1878–87, also in each of the six years, 1885–90.*

Period of Time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. 10 yrs., 1878–87	37.27	2.09	2.89	2.28	2.49	3.52	4.24	3.44	3.21	3.72	3.45	2.98	2.69
1885	35.82	2.70	.73	.38	2.47	2.30	6.01	2.52	5.82	3.75	3.08	2.90	2.14
1886	32.16	3.05	1.72	2.74	2.40	2.58	2.29	1.36	4.21	5.36	1.97	2.35	2.13
1887	29.82	2.27	4.47	1.18	1.54	2.25	2.76	2.46	1.93	2.84	2.48	3.10	2.55
1888	29.55	1.99	1.77	2.51	2.15	3.73	2.87	2.02	2.38	2.66	2.68	2.92	1.89
1889	28.18	2.42	2.04	1.01	1.62	4.21	3.82	3.07	.98	1.85	1.10	3.10	2.98
1890	30.20	3.53	2.40	2.12	3.37	4.80	3.74	1.47	3.63	2.09	4.97	2.43	1.70

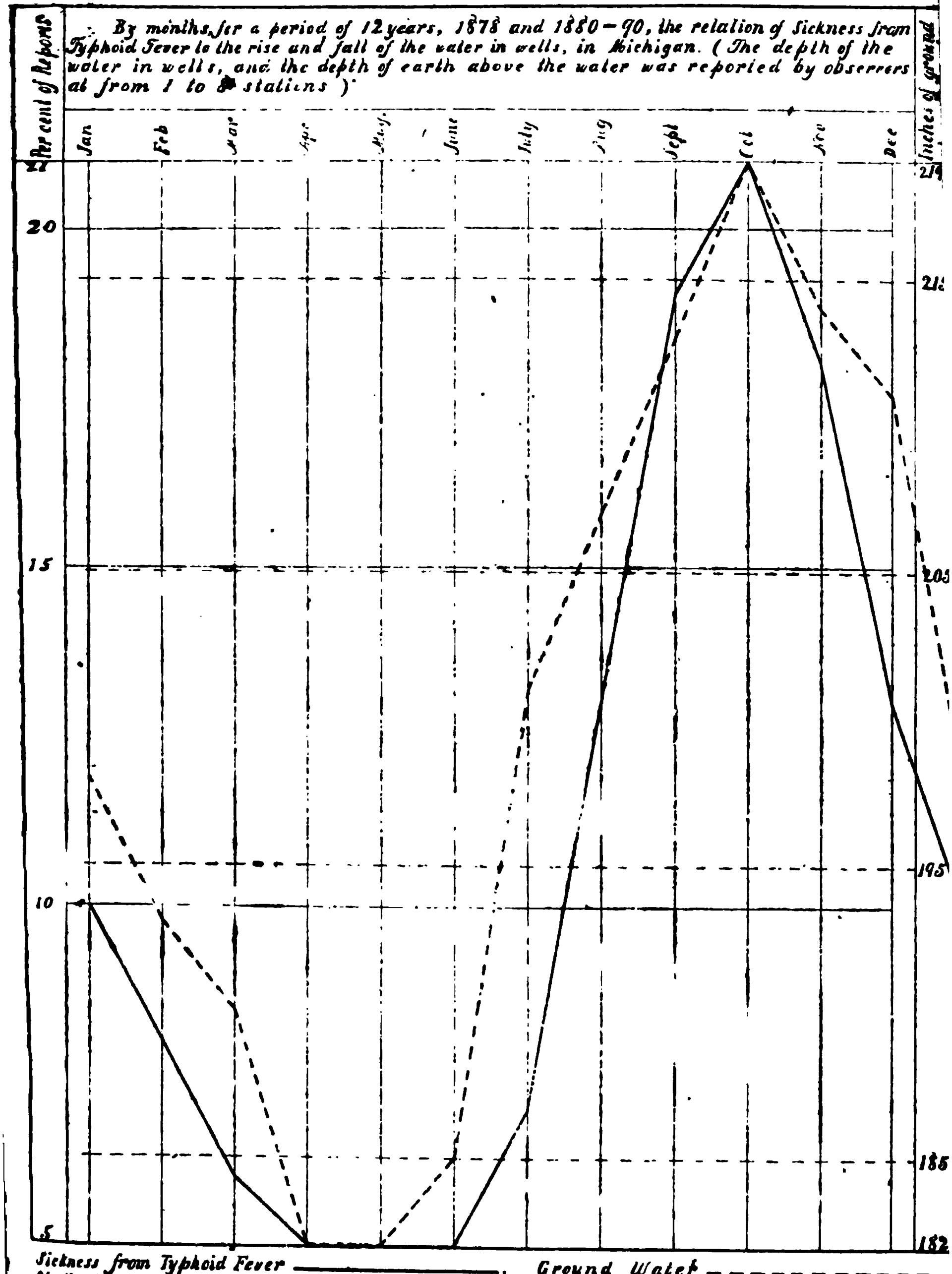
Table 10 exhibits the relation of low water in wells to sickness (as shown by the weekly card reports) and the reported deaths from typhoid fever in Michigan, for the twelve years, 1878, 1880–90. The facts presented in two lines of this table, low water in wells and sickness from typhoid fever, for a ten year period, are graphically represented in a diagram on page 256 of the Annual Report of this Board for 1889.

The diagram, on page 229 of this Report, graphically represents the relation of the sickness from typhoid fever, to the rise and fall of the water in wells, in Michigan, for the twelve-year period comprising the years 1878 and 1880–90.

TYPHOID FEVER IN MICHIGAN IN 1890.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

LOW WATER IN WELLS, AND SICKNESS FROM TYPHOID FEVER, IN MICHIGAN.



By months, for a period of 12 years, 1878 and 1880–90, the relation of Sickness from Typhoid Fever to the rise and fall of the water in wells, in Michigan. (The depth of the water in wells, and the depth of earth above the water was reported by observers at from 1 to 8 stations)

Sickness from Typhoid Fever ————————. *Ground Water* – – – – – – – – – – – –.

*Indicating what per cent of all reports received stated the presence of Typhoid Fever then under the observation of the physicians reporting

Over 33000 weekly reports of sickness, and over 500 observations of the depth of water in wells are represented in this diagram.

NOTE.—The danger from typhoid fever appears to be greatest in October, when the water in wells is lowest, that is, when there are the most "Inches of earth above the ground-water." The danger is least in May, when the water in wells is highest.

Comprehensive study of this subject was made by the Secretary of this Board in a paper read before the American Public Health Association, at St. Louis, Mo., Oct. 16, 1884, which was printed in the Annual Report of this Board for the year 1884, pp. 89–114, and the study was continued subsequently, in the Annual Reports of this Board for the years 1888, pp. lv–lvii; 1889, pp. 254–262; 1890, pp. 247–251.

The evidence is conclusive that there is a necessary relation between the low water in wells and the sickness from typhoid fever.

TABLE 10.—*Exhibiting, for Michigan, by Months, during the Twelve Years, 1878, 1880-1890,* the Relation of Low Water in Wells to Sickness from Typhoid Fever: also, the Reported Number of Deaths from Typhoid Fever.*

Month.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. inches of ground above the water in wells†	200	195	191	188	183	186	202	209	215	220	215	212
Fluctuation from Max. Depth of water in wells	17	12	8	0	0	3	19	26	32	37	32	29
Sickness from Typhoid fever‡	10	8	6	5	5	5	7	13	16	21	18	13
Av. number of reported deaths from Typhoid fever‖	24	21	24	25	24	22	27	58	93	101	72	34

* The data relating to the sickness and the deaths from typhoid fever in the years 1878, 1880–90, were used in order to coincide with the same period for which the measurements of ground above the water in wells were already obtained.

† The year 1879 could not be included as, for that year, there was no station from which reports were received for the whole year. The stations used in the compilation of this line, and the years for which reports were received and compiled from each are as follows: Elsie, 1878; Thornville, 1880–1 and 1885–7; Hillsdale, 1880, 1884, 1887–90; Mendon and Union City, 1880; Linden and Dearborn, 1881; Brockway Center, 1882 and 1883; Otisville and Woodland, 1882; Saginaw City, 1888; Kalamazoo, 1884, 1888 and 1889; Lansing, S. B. of H., 1885–90; Ann Arbor and River Raisin, 1886–90; Alpena, 1887–88; Otsego, 1887; Traverse City, 1888–90; Battle Creek, 1888.

‡ Per cent of weekly reports, from observers in different parts of the State, which stated the presence of typhoid fever.

‖ The data used in the compilation of this line were taken from the Registration Reports of Michigan.—Vital Statistics.

From January to May the fluctuations in the sickness from typhoid fever and the depth of the water in wells are nearly coincident. In June the increase in the sickness follows the decrease of the water with an interval of about a month. Thence during the rest of the year, the agreement of the two is very close. The maximum of sickness and the minimum of water are coincident in October.

The stations at which the measurements of water in wells are taken and the number of years which are available from each station are stated in the dagger (†) footnote at the bottom of Table 10, this page. The Office has been unable thus far to get accurate measurements of the height of water in wells for a long period of years from any stations in Michigan. This absence of extensive data is especially deplored when a comparison of one year with a series of years is desired, but in the averages for a series of years by *months*, the evidence is accurate and valuable.

It is believed that all the wells from which measurements of water are made for this office, except the well at Lansing, are used. The well at Lansing is in the capitol grounds, far enough from other wells so as not to be liable to be affected by the rise and fall of the water in other wells from daily use, and so would more nearly represent the gradual rise and fall of the *ground water* than would measurements in wells from which water is drawn. But it has been found, by long-continued observations and investigations, that the rise and fall of the typhoid fever is in much closer relation to the fall and rise of the water in wells in actual use than to the fluctuations in the well at Lansing.

TABLE 11.—GROUND WATER.—*Inches of Earth above the Water—by Months for the six years, 1885-90, and for the last four months of the year 1884, and for each of the six years, 1885-90, at* **Lansing**, *Mich.,—Well in the Capitol Grounds.*

Period of time.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1885-90	292	293	294	292	289	289	288	290	291	293	295	295	297
1884	.....	.....	.....	.....	.....	.....	.....	.....	.....	290	291	293	292
1885	284	288	289	292	280	281	279	282	283	282	285	281	280
1886	281	276	278	274	272	278	277	282	287	287	286	291	294
1887	290	296	287	280	282	285	288	290	291	291	294	297	294
1888	294	292	296	294	293	293	293	293	290	293	297	294	300
1889	304	298	304	304	302	304	299	299	302	305	308	311	312
1890	300	309	307	305	303	296	292	293	295	300	300	298	300

Table 11 exhibits the height of ground above the water in the well at Lansing, by months and year for the six years, 1885-90. In table 13 the first line of table 11 is used, with the average line in the following table (12), together with the average sickness from typhoid fever during the same years.

TABLE 12.—*Temperature of the Water in the Well at the State Capitol in* **Lansing**, *Mich., by Months for the Six Years, 1885-90, and the last four months of the year 1884.*

Year and period of years.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Av. Six Y'rs, 1885-90.	49	50	47	46	46	48	48	48	50	51	51	52	50
1884	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	51	51	49
1885	47	49	47	43	42	46	48	47	48	50	50	51	45
1886	48	49	47	46	45	46	46	47	50	52	52	51	50
1887	48	50	41	42	46	47	48	49	51	50	51	52	51
1888	49	50	49	48	47	48	48	47	50	51	51	52	51
1889	50	50	49	49	48	49	49	50	50	50	51	51	51
1890	50	50	49	49	48	49	49	49	50	51	51	52	51

TABLE 13.—*Sickness from Typhoid Fever in Michigan (as indicated by the Weekly Card Reports by all Observers) and the depth of Earth (in inches) above the Water in the Well, and the temperature of the water in the Well, at* **Lansing,** ***Michigan,*** *by Year and Months for the Six Years, 1885–90.*

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Sickness from Tyhold Fever *	9	8	6	4	3	4	5	6	12	17	17	15	10
Inches of Earth above Water in Well	292	293	294	292	289	289	288	290	291	293	295	295	297
Temperature of water in Well	49	50	47	46	46	48	48	48	50	51	51	52	50

* Per cent of all reports received (from observers in different parts of the State) which stated the presence of typhoid fever.

From table 13 it may be seen that the relation of sickness from typhoid fever to the ground water, as represented by the depth of water in the well at Lansing, is not so close as that which is shown to exist between sickness from typhoid fever and low water in wells in Table 10, on page 230 of this report. It is still possible, however, that if we could obtain measurements of water in *unused* wells in the different localities whence the reports of typhoid fever are derived, or could we have a full and correct report of all cases of the disease which occurred in Lansing during the same period for which we have measurements of the well there, and before there was a general water supply in Lansing, comparison of those data might show the existence of as close affinity between low *Ground-water* and typoid fever, as exists between typhoid and *low water in wells.*

TABLE 14.—*Exhibiting the Average Total Annual Rainfall at Stations in Michigan, the same for Lansing, the inches of Earth above the Ground Water at* **Lansing,** *the Inches of Water in an undisturbed Well at Lansing, and the Reported Sickness from Typhoid Fever in Michigan, as indicated by the per cent of all the weekly card-reports which stated the presence of Typhoid Fever.*

Year, and period of years.	Av. Total Annual Rainfall at Stations in Michigan, in inches.	Total Annual Rainfall at Lansing, in inches.	Inches of Earth above the Ground Water at Lansing.	Inches of Water in an unused Well at Lansing.	Ground Water, higher (+) or lower (−) than the six years' Average in inches.	Av. Per Cent of all Weekly Card-Reports Stating the presence of Typhoid Fever.	More (+) or less (−) Sickness from Typhoid Fever than the six years' average.
Av. 6 Y'rs, 1885–90	30.96	29.15	291	32	=	9	=
1885	35.82	34.51	284	40	+ 7	8	−1
1886	32.16	29.52	281	42	+10	8	−1
1887	29.82	30.08	290	34	+ 1	10	+1
1888	29.55	25.76	294	29	− 3	10	+1
1889	28.18	23.28	304	19	−13	10	+1
1890	30.20	31.73	292	28	+ 1	8	−1

Table 14 is a summary of the facts presented in tables 8 and 9, with the addition of the facts relative to the height of water in the well at Lansing.

From the evidence given in this table (14) it appears that, notwithstanding increased population and more numerous and better reports from local health officials, the reported prevalence of typhoid fever in Michigan was less in 1890 than in either of the previous three years; and also than the average for the six years 1885-90. The rainfall, both throughout the State and at Lansing, was greater in 1890 than for either of the previous three years; and at Lansing was more than the average for the six years 1885-90. In this connection, it is proper to hold in mind the fact that the efforts of the State Board of Health, the issuing of leaflets, diagrams and other literature bearing upon the restriction and prevention of typhoid fever, have continued for a number of years, and there is reason to believe that the influence of that work is increasing; possibly, if it were not for that work, the typhoid sickness during 1890 might have been as much or more, than in the preceding years, notwithstanding increased rainfall and water in wells.

SMALL-POX IN MICHIGAN

DURING THE YEAR ENDING DECEMBER 31, 1890.

During the year ending December 31, 1890, Michigan was comparatively free from small-pox, only two cases (no deaths) having been reported to this office, one in Grand Rapids, Kent county, and one in Big Rapids, Mecosta county. Both cases occurred in February.

SOURCE OF CONTAGIUM.

The sources of contagium in the above mentioned two outbreaks, as reported by the health officers, were not positively known; in one instance, Grand Rapids, it was thought it might have been from loading and unloading lumber cars, where, it was supposed, that tramps were "lounging around;" in the other instance, Big Rapids, the health officer reported, "It may have been on the cars."

PERIOD OF INCUBATION.

In answer to the question as to the facts bearing on the subject of the period of incubation, I. W. Badger, health officer of Big Rapids, replied. "If she was exposed on the train it was eight days before the disease made its appearance."

SMALL-POX IN MICHIGAN IN 1890 COMPARED WITH PRECEDING YEARS.

The following table exhibits the number of reported cases and deaths, etc., from small-pox in the State of Michigan for the nine years ending December 31, 1890:

TABLE 1.—*Exhibiting for each of the Nine years, 1882-90, the numbers of reported Localities, Outbreaks, Cases, Deaths, Average number of cases per Locality, Average number of Cases per Outbreak, and per cent ratio of Deaths to Cases of Small-pox in Michigan. Compiled in the Office of the Secretary of the State Board of Health, from reports made by local health officers.*

Years.	Localities.	Outbreaks.	Cases.	Deaths.	Average Number of Cases per Locality.	Average Number of Cases per Outbreak.	Ratio of Deaths to Cases. Per Cent.
1882	61	....	589	159	9.7	....	27
1883	8	....	29	2	3.6	....	7
1884	5	4	22	3	4.4	5.5	14
1885	9	9	27	6	3	3	22
1886	4	4	*24	7	6	6	29
1887	2	4	†4	0	2	1	0
1888§	11	12	42	6	3.8	3.5	14
1889	14	‡14	57	4	4	4	7
1890	2	2	†2	0	1	1	0

* Includes two cases varioloid.

† Includes one case varioloid.

‡ This number includes two outbreaks which began in 1888, but the majority of cases and deaths in which occurred in 1889.

§ The numbers in this line, in a similar table on page 273 of the Annual Report of this Board for the year 1889, erroneously contained 18 cases and one death at Azalia, which occurred in 1889; the numbers here given for 1888 are the correct ones.

SMALL-POX IN GRAND RAPIDS.

In regard to this outbreak, only one case occurred, H. N. Cargill, clerk of the board of health of Grand Rapids, wrote to the Secretary of this Board, February 10, 1890, as follows:

"Friday evening last, at about 8:30, I was notified by Dr. J. J. Whitfield, that he had a suspicious case that he was treating, at 741 Division St., in this city, which resembled in the eruption small-pox. I hastened immediately to notify Dr. Saunders, the health officer, and we proceeded together to take the necessary steps to investigate as to whether it was a real case of small-pox; and if so to take every precaution to protect the public. The health officer, not willing to rely upon his own judgment entirely, considered it best to call upon the service of another physician, and fortunately secured Dr. Hazlewood, who happened opportunely to be going in that direction, (it being then about 10 P. M). We visited the house and found that it was a clear case; the patient's body being completely covered with fiery red blotches considerably raised above the surface of the skin, generally from an eighth to one-fourth inch in diameter, here and there one, with an appearance of filling, sharp and pointed.

"The house he was in was a laborers' boarding house, with seven or eight regular boarders, besides five members of the family, and several others took dinners there; also two families who were intimate, visited daily. We immediately took the names of the inmates, of all the families, about twenty-eight persons altogether, more or less exposed, and got patrol guards, and by 12 o'clock at night, while all were asleep, made all secure, with instructions to allow no one to enter or leave the several premises. We then telegraphed for some fresh vaccine points. We then sent word to the steward of the hospital to immediately warm up ready to receive patients, and early in the morning we removed the sick one, and two others who had been the most exposed, to the hospital. The others were immediately vaccinated (that is in the morning), and to this writing there are no symptoms of others coming down, and we hope there will be no new cases; but should not be surprised if there were. We do not consider that there is any danger of any spread of the disease, as we are in condition to take prompt care of it, owing to the fact that our city can boast of a most complete provision for its suppression. The quietness with which our citizens received the information, is proof of the confidence they have in the health department.

"We have no positive knowledge as to how this man contracted the disease as yet. He was employed at the south end of the city loading and unloading lumber cars, and says there must have been some tramps lounging around, he thinks, that he came in contact with. We may perhaps learn more after a little. He is doing well, is sitting up today looking out the window. We don't anticipate any severe sickness in his case. Any new developments, will advise you."

On March 19, Wm. G. Saunders, health officer of the city of Grand Rapids, in his special final report of this outbreak of small-pox, reported substantially as follows with reference to methods of restriction enforced:

The patient was put in small-pox hospital; other persons exposed quarantined and carefully vaccinated; about seventy-five were vaccinated, and in nearly every case it took effect; the persons quarantined were held fourteen days after exposure; the patient twenty-four days after sickness commenced.

Fifty pounds of sulphur were burned, clothing and bedding disinfected by burning sulphur, and washed in zinc solution; discharges of the patient disinfected by "six pounds of sulphate of iron." After the outbreak was over all clothing worn by the nurses and others exposed to infection was disinfected by fumigation, and a part of it burned.

"Only one case occurred; have no fear of further cases."

VARIOLOID IN THE CITY OF BIG RAPIDS.

A case of varioloid occurred in the city of Big Rapids, Mecosta county, February 21, 1890. Of this case Dr. I. W. Badger, health officer of the city, wrote on March 4, substantially as follows:

Mrs. Addie Murray, was the name of the woman who was afflicted with varioloid, she was located at the residence of H. A. Bestor, corner of Warren avenue and Elm street. She came to Big Rapids in company with a little daughter nine years of age, about eight days before she was taken sick, and was employed at Mr. Bestors to do house work.

How she was exposed to the disease was not known. She had been away from the city three or four weeks. During her absence she was at a son's in Hinton township, Mecosta county. In returning to Big Rapids she boarded the train at Mecosta, Mecosta county. "May have been exposed on the cars."

As soon as it became known that she had varioloid, the customary measures in the matter of preventing the spread of the disease were taken. All in the house where the case broke out, and many others in the city were vaccinated. The patient with her little girl, Almer Murray, aged nine years, were removed to the hospital. The little girl was vaccinated.

The Big Rapids Dispatch, February 24, contained the following:

"The small-pox patient and her nine year old daughter have been removed to the house of Mrs. Mary Beck, less than half a mile east of the upper depot, where they will probably remain until all danger is passed. Mrs. Beck is not afraid of small-pox, and has been employed to nurse the woman. J. B. Haist, who has had the disease, has been employed to take to the house such things as may be needed and to keep the community informed relative to the case."

On March 5, another report was received from Dr. I. W. Badger, as follows:

"Alma Murray, was thoroughly vaccinated and she has not taken the disease.

"Her mother who had varioloid is nearly well; shall hold them in quarantine one more week, during the time we shall thoroughly fumigate the house and contents with their wearing apparel. After which time we will know without doubt whether the little girl will have the disease.

"There has been quite a number vaccinated by the physicians of the city, as recommended."

March 17, the health officer wrote:

"We expect to remove the quarantine and let Mrs. Murray do for herself this next week.

"The house of Mrs. Beck, together with the contents and the raiments have been thoroughly exposed to sulphur, also five pounds copperas have been used, and carbolic acid solution, also chloride of lime.

"From present indications there will be no more cases of this disease."

SMALL-POX IN OTHER STATES IN 1890.

The following outbreaks of small-pox in localities outside of the State of Michigan were reported to this office in compliance with the resolution adopted by the International Conference of State and Provincial Boards of Health, held at Toronto, Ontario, October 6, 1886:—

At Meriden, Connecticut, February 14, 1890.
At Anna, Illinois, February 15, 1890.
At East St. Louis, Illinois, February 15, 1890.
At Great Barrington, Massachusetts, February 18, 1890.
At Meriden, Connecticut, April 1, 1890.
At Topeka, Kansas, April 10, 1890.
At Searsport, Maine, June 6, 1890.
At Athens, Ohio, October 18, 1890.
At Grosse Isle quarantine, Province of Quebec, November 15, 1890.

MEASLES IN MICHIGAN.

DURING THE YEAR ENDING DECEMBER 31, 1890.

There were reported to the Secretary of the State Board of Health in all 421 outbreaks of measles, in 407 local jurisdictions, as having occurred in Michigan during the year 1890; and in these outbreaks there were reported to have occurred 11,911* cases and 140* deaths. For the preceding year, 1889, there were reported only 2,899 cases and 28 deaths in 148 local jurisdictions. Each year the State Board of Health is making more effort to get local health officials to take measures to prevent the spread of measles, and to make reports to this office concerning that disease in their localities, and it is probable that a larger proportion of the actual numbers of cases and deaths were reported in 1890 than in 1889.† But the principal reason why there were so few cases and deaths from measles reported in 1889 is that measles runs in waves, the maximum crests of which are about 7 or 8 years apart, and a trough between two waves of measles fell in the year 1889. This may be seen by referring to Table 1, and the accompanying diagram.

TABLE 1.—*Exhibiting the reported number of deaths from measles per 100,000 persons living in Michigan in each of the 24 years, 1869-91. Compiled from the Secretary of State's Vital Statistics of Michigan.* (*Population estimated by average annual increase, by Dr. Wilbur, Chief of Vital Statistics in State Department.*)

Year.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
Deaths	8.66	12.88	4.72	5.45	14.12	18.56	3.37	9.50	6.10	4.13	1.08	10.49	7.63	15.21	8.68	14.54	7.91	2.04	6.75	14.56	20.62	5.08	10.94	10.51

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* Only the 37 cases which died were reported from the city of Detroit. If in that city the deaths were the same per cent of the cases as was reported for the rest of the State (.87 of one per cent), 4,252 cases of measles occurred in that city during the year 1890, making the number of cases for the whole State 16,126, instead of 11,911 as given above. But probably not half of the cases of measles were reported, as is evidenced in the note following this.

† Probably not half of the cases and deaths are yet reported; this is evident from the fact that for the year 1890 there were reported to the Secretary of State 229 deaths from measles; and it is well known that not all deaths are reported to the Secretary of State. The Secretary of the State Board of Health estimates that in order to equal the actual number of deaths, the reported deaths should be increased by forty per cent. If this is done, the probable number of deaths from measles in 1890 is found to be 321.

Reported Deaths from Measles in Michigan, 24 Years, 1868-91.

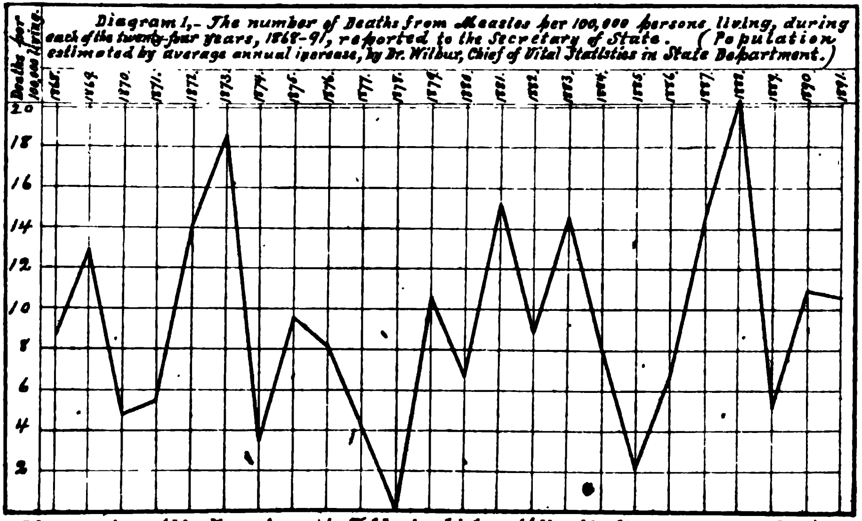

Diagram 1,- The number of Deaths from Measles per 100,000 persons living, during each of the twenty-four years, 1868-91, reported to the Secretary of State. (Population estimated by average annual increase, by Dr. Wilbur, Chief of Vital Statistics in State Department.)

Diagram 1, graphically represents Table 1 which supplies the figures in detail.

MEASLES SHOULD BE RESTRICTED.

As yet very little effort is made in localities to restrict measles, as there is quite a prevalent but erroneous idea that measles is not a dangerous disease. The following are some important reasons which have led the Michigan State Board of Health to class measles, for the purpose of restriction, with "diseases dangerous to the public health": (1) it is a communicable disease and therefore preventable; (2) it causes more than two hundred deaths each year in Michigan; (3) it causes several thousands of cases of sickness each year; (4) it frequently injures or destroys the organs of sight or hearing of those who survive the disease[1]; (5) it frequently prepares the way for and is closely followed by pneumonia and consumption*; (6) there is danger of measles becoming as prevalent in Michigan as it now is in England where it destroys more lives than diphtheria and scarlet fever combined.†

As may be seen by Table 2, isolation and disinfection were reported to have been enforced in only 6 of the 419 outbreaks of measles; and these measures were both reported to have been neglected in 57 outbreaks. The difference, in favor of isolation and disinfection, is very marked,—the average number of cases per outbreak where isolation and disinfection were neglected having been 84.54, and the deaths .77; and in the 6 outbreaks where these measures were enforced the average number of cases was only 3.16, and there were no deaths. In two outbreaks isolation, only, was reported as having been enforced, and one outbreak disinfection, only, was reported as having been enforced. In the 351 outbreaks in the reports of which isolation or disinfection or both were not mentioned or the statements were doubtful, considerable effective work was apparently done in the way of isolation and disinfection. The result is seen by comparing the average numbers of cases and deaths in this "doubtful" column with those in the column headed "Isolation and Disinfection Neglected." In the "doubtful" column the average number of cases was only 17.92 and the deaths .11; in the "neglected" column the average number of cases was 84.54 and the deaths .77. In other words, there were seven times as many deaths and nearly five times as many cases in those outbreaks known to be neglected, as in those outbreaks classed as "doubtful" because the reports were not sufficiently definite to be classed as certainly "isolated and disinfected." If in the 353 outbreaks in the "doubtful" column there had been no isolation or disinfection, it is probable that the average numbers of cases and deaths would have been about the same as in the 57 outbreaks in which both isolation and disinfection were known to have been neglected, or an average of 84.54 cases and .77 deaths per outbreak, or a total of 29,843 cases and 272 deaths in the 353 outbreaks. Taking from these the 6,326 cases and 59 deaths that occurred, there remain 23,517 cases and 213 deaths indicated as having been prevented by isolation and disinfection in these 353 outbreaks.

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* Atkinson, in Wood's Reference Handbook of the Medical Sciences, Vol. IV, p. 681; Quain, Dictionary of Medicine, p. 927; Ziemssen, Cyclopedia of the Practice of Medicine, Vol. II, pp. 102-106.

† According to the Fifty-first Annual Report of the Registrar-General, of Births, Marriages and Deaths in England, p. lii,—during the 4 years 1881-8 the average annual number of deaths, per million persons living, from scarlet fever and diphtheria combined was only 395, while from measles alone it was 577.

It is to be hoped that health officers will make all possible effort to get the people and attending physicians to coöperate with them in restricting measles by strict isolation and thorough disinfection.

TABLE 2.—*Exhibiting the numbers of Outbreaks, Cases and Deaths from Measles in Michigan during the year 1890, and also the average numbers of Cases and Deaths per Outbreak in each of the following groups of Outbreaks: (1) All Outbreaks; (2) the 353 Outbreaks in which Isolation or Disinfection or both were Neglected or the statements were Doubtful; (3) the 2 Outbreaks in which only Isolation was Enforced; (4) the 1 Outbreak in which only Disinfection was Enforced; (5) the 57 Outbreaks in which both Isolation and Disinfection were Neglected; and (6) the 6 Outbreaks in which both Isolation and Disinfection were Enforced.*

	(1) All Outbreaks.*			(2) Isolation or Disinfection not mentioned or statements Doubtful.			(3) Only Isolation Enforced.			(4) Only Disinfection Enforced.			(5) Isolation and Disinfection Neglected.			(6) Isolation and Disinfection Enforced.		
	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.	Outbreaks.	Cases.	Deaths.
Total..........	419	11,189	103	353	6,326	59	2	17	0	1	3	0	57	4,819	44	6	19	0
Average.......	....	26.70	.25	...	17.92	.11	....	8.50	0	....	3	0	....	84.54	.77	....	3.16	0

* The number of outbreaks, cases, and deaths given in this column differ from those given in the first paragraph of this article, those from Detroit and Grand Rapids not being included in this table, because in those cities measles is present throughout the year, and as the reports are now made there is no way of distinguishing separate outbreaks.

INFLUENCE OF AGE IN MEASLES.

The reports of local health officials in Michigan for the year 1890, gave the ages of 8,367 persons who were sick with measles, and of 21 persons who died of that disease. Table 3 represents, in certain age-groups, (1) the number of cases and (2) the number of deaths from measles; (3) the per cent that the cases in each group were of all cases of measles; (4) the per cent that the deaths in each group were of all deaths from measles; and (5) the per cent that the deaths in each group were of the cases in each group respectively,—compiled from all reports for the year 1890 which stated the ages.

By this table (3) it may be seen that the greatest proportion of cases of measles occurred in persons from 5 to 10 years of age,—over one-third (37.87 per cent) of all cases having occurred in that period of age. The next highest five-year period is the first five years of age, "0-5." From the second five-year period the numbers of cases grade downward, each succeeding period being lower than the preceding period.

The probable reason for the large proportion of cases in persons from 5 to 10 years of age is that a larger proportion of children commence going to school in that period than at any other (the schools being centers of infection in localities where cases of measles are not strictly isolated); and that a large proportion of persons in the later age-periods are protected by having had measles in earlier ages.

By Table 3 it may also be seen that the greatest proportion of deaths occurred in the first five-year period, over half of all deaths (57.1 per cent) having occurred in that age-period; and of these five years the greatest proportion of deaths (23.8 per cent of all deaths from measles) occurred in the second year of age.

The last line of this table, giving the per cent the deaths in each group were of the cases in each group respectively, is perhaps the most important one. When the data for several years can be combined in a line like this, it will go far towards settling the question as to the age in which there is least danger of a case of measles proving fatal in Michigan. The data for the one year, 1890, indicate that there is greatest danger of a case proving fatal during the first five years of age, and that there is least danger from about 5 or 10 to 25 or 30 years of age,—the per cent of cases proving fatal having been: in children under 5 years of age, 1.54; in persons from 5 to 25, .29; and in persons from 25 to 55, 1.14.

There is an erroneous and very harmful belief, quite prevalent among parents, that measles cannot ultimately be escaped any more than teething, and that the least dangerous time for persons to have the disease is while quite young children,—the reverse of the facts as shown above. As a result of this mistaken belief there is frequently presented the shocking spectacle of a mother deliberately exposing her young child to measles, like the devoted but deluded Indian mother who, in tears, consigns her babe to the "sacred river" Ganges, to become food for crocodiles, in the vain belief that it is best for her child. The following, quoted from the report of Dr. G. C. Hafford, health officer of the village of Manistique, relative to the difficulties which he encountered in endeavoring to restrict an outbreak of measles in that village is an instance illustrating the force of this mistaken belief, and, in this respect, his report is representative of the reports of many health officers: "Many people, wanting children to have measles while small, would intentionally expose them."

TABLE 3.—*Exhibiting, in certain Age-Groups, the number of Cases and the number of Deaths from Measles; the per cent that the Cases in each group were of All Cases; the per cent that the Deaths in each group were of All Deaths; and the per cent that the Deaths in each group were of the Cases in that group,—Compiled from all reports for the year 1890 which stated the ages.*

	Number and per cent of Cases and Deaths in certain Age-groups.																	
Ages in Groups of Years	All Ages.	0-1.	1-2.	2-3.	3-4.	4-5.	0-5.	5-10.	10-15.	15-20.	20-25.	25-30.	30-35.	35-40.	40-45.	45-50.	50-55.
No. of Cases	3,363	84	143	156	191	205	779	1,275	639	318	179	71	54	28	11	10	2
Per cent the cases in each group were of all cases	100	2.49	4.25	4.61	5.68	6.09	23.16	37.91	19.00	9.46	5.32	2.11	1.61	0.83	0.33	0.30	0.06
No. of Deaths	21	3	5	3	0	1	12	3	1	2	1	0	0	1	0	1	0
Per cent the deaths in each group were of all deaths	100	14.3	23.8	14.3	0	4.8	57.1	14.3	4.8	9.5	4.8	0	0	4.8	0	4.8	0
Per cent the deaths in each group were of cases in that group	0.62	3.57	3.50	1.92	0	0.49	1.54	0.24	0.16	0.63	0.56	0	0	3.57	0	10.00	0
				1.54						.29					1.14		

SOURCE OF CONTAGIUM OF OUTBREAKS OF MEASLES.

Of the 419 outbreaks of measles reported to this office, as having occurred in the year 1890, the local health officials reported relative to the source of contagium in ways which may be summarized as follows:—Traced to a former case, 146; probably traced to a former case, 3; unknown, 91; not reported, 179.

TABLE 4.—*Reported Source of Contagium of Outbreaks of Measles in Michigan during the year 1890.*

Source.	Numbers of Outbreaks.
Traced to a former case	146
Probably traced to a former case	3
Unknown (includes 9 reported "epidemic")	91
Not stated	179
All outbreaks	419

TABLE 5.—*First, second, and third localities, where the second locality was inf*
with measles from the first, and the third was infected from the second; an
numbers of cases and deaths from measles in the first, second, and third local
(Compiled from reports of health officers who were able to trace the source of
tagium to other localities.)

Primary Localities from which Measles Spread.	In First Locality.		Secondary Localities infected from Primary.	In Second Locality.		Tertiary Localities infected from Secondary.	In ' Lo
	Cases.	Deaths.		Cases.	Deaths.		Cases.
Berrien county: Galien township	1	0	Berrien county: Galien village	1	0		
Berrien county: Lake township	*	....	Van Buren county: Hartford village	3	0		
Branch county: Butler township	2	0	Hillsdale county: Litchfield village	63	0		
Calhoun county: Albion city	303	2	Calhoun county: Clarence township	7	0		
			Jackson county: Spring Arbor	1	0		
			Hillsdale county: Litchfield village	1	0		
Calhoun county: Homer village	100	2	Calhoun county: Homer township	5	0		
Cass county: Dowagiac city	3	0	Cass county: Silver Creek township	9	0		
			Volina township	50	0		
			Van Buren county: Hartford village	1	0		
Clinton county: St. Johns village	500	5	Gratiot county: Alma village	8	2		
Crawford county: Grayling city	*	....	Crawford county: Grove township	5	0		
Eaton county: Eaton Rapids	*	....	Lenawee county: Rome township	1	0		
Genesee county: Flushing village	*	....	Genesee county: Clayton township	6	0		
Gladwin county: Grant township	*	....	Gladwin county: Billings township	6	0		
Grand Traverse county: Traverse City	*	....	Grand Traverse county: Long Lake township	2	0		
Gratiot county: Fulton township	*	....	Gratiot county: Newark township	2	0		
Hillsdale county: Hillsdale city	22	0	Hillsdale county: Moscow township	8	0		
Houghton county: Calumet village	*	....	Houghton county: Adams township	275	0		
Houghton county: Red Jacket village	2	0	Keweenaw county: Sherman township	13	0		
Huron county: Meade township	21	0	Huron county: Bad Axe village	17	0	Huron county: Sheridan township	22
Sand Beach village	300	10	Sanilac county: Forester township	20	0		
Ingham county: Lansing city	*	....	Ingham county: Meridian township	9	0		
Mason city	*	....	Webberville village	100	1		

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* This outbreak was not reported to this office by the health officer of the "first" locality at the
it occurred.

TABLE 5.—CONTINUED.

Primary Localities from which Measles Spread.	In First Locality.		Secondary Localities infected from Primary.	In Second Locality.		Tertiary Localities infected from Secondary.	In Third Locality.	
	Cases.	Deaths.		Cases.	Deaths.		Cases.	Deaths.
Ionia county: Otisco township	*	...	Mecosta county: Morley village	51	1	Mecosta county: Aetna township	25	0
Isabella county: Mt. Pleasant city	*	....	Midland county: Coleman village	1	0			
Jackson county: Jackson city	*	....	Lenawee county: Ogden township	1	0			
Kalkaska county: Kalkaska village	*	....	Kalkaska county: Rapid River township	51	1	Kalkaska county: Cold Spring tp.	7	0
			Orange township	21	0			
Kent county: Grand Rapids city	754	3	Baraga county: Midville village	16	0			
			Eaton county: Charlotte city	21	0			
			Kent county: Walker township	8	0			
			Muskegon county: Whitehall village	2	0			
Manistee county: Cleon township	*	....	Manistee county: Morilla township	14	0			
Mecosta county: Deerfield township	15	0	Mecosta county: Morley village	2	0			
Midland county: Midland city	*	....	Midland county: Lee township	11	0			
Montcalm county: McBride village	*	....	Montcalm county: Ferris township	75	1			
Montcalm county: Greenville city	*	....	Wayne county: Northville village	1	0			
Muskegon county: Muskegon city	225	2	Muskegon county: No. Muskegon village	40	0			
			Whitehall village	1	0			
			Wexford county: Wexford township	1	0			
Oakland county: Oxford township	*	....	Lapeer county: Metamora township	13	0			
Oakland county: Lyons township	*	....	Oakland county: Novi township	1	0			
Oakland county: South Lyons village	10	....	Livingston county: Brighton township	5	0			
Otsego county: Lake township	*	....	Ogemaw county: Beaver Lake township	3	0			
Saginaw county: Chesaning township	15	0	Saginaw county: Chesaning village	24	0	Saginaw county: Albee township	150	1
			Shiawassee county: New Haven township	....	....			
Saginaw county: Merrill village	*	....	Saginaw county: Lakefield township	1	0			

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* This outbreak was not reported to this office by the health officer of the "first" locality at the time it occurred.

MEASLES IN MICHIGAN IN 1890.

TABLE 5.—CONTINUED.

Primary Localities from which Measles Spread.	In First Locality.		Secondary Localities infected from Primary.	In Second Locality.		Tertiary Localities infected from Secondary.	In Lo
	Cases.	Deaths.		Cases.	Deaths.		Cases.
Saginaw county: Saginaw city	236	3	Midland county: Homer township	20	0		
Saginaw county	----	----	Clare county: Hayes township	8	0		
Tuscola county: Mayville village	*	----	Tuscola county: Dayton township	3	0		
Van Buren county: Decatur village	75	0	Van Buren county: Decatur township	1	0		
Lawton village	*	----	Porter township	75	0		
Washtenaw county: Ann Arbor city	*	----	Leelanaw county: Bingham township	8	0		
			Livingston county: Unadilla township	50	0		
Wayne county: Detroit city	*	----	Macomb county: Lenox township	19	0		
			St. Clair county: Columbus township	20	0		
			Wayne county: Bedford township	4	0		
Wayne county: Van Buren township	*	----	Washtenaw county: Superior township	3	0		
Wexford county: Cadillac city	101	6	Manistee county: Manistee city	3	0		
Outside the State.							
Canada	----	----	Ionia county: Campbell township	1	0		
Chicago	----	----	Calhoun county: Burlington township	1	0		
			Mecosta county: Aetna township	2	1		
New Carlisle: Indiana	----	----	Berrien county: Galien village	1	0		
South Bend: Indiana	----	----	Cass county: Calvin township	19	0		
Kansas	----	----	Oakland county: Pontiac city	150	0		
New York city	----	----	Marquette county: Michigamme township	10	0		
Ohio	----	----	Allegan county: Plainwell village	2	0		
			Branch county: Coldwater city	57	0		
			Lenawee county: Morenci village	1	0		
Marquette: Wisconsin	----	----	Baraga county: Baraga township	5	0		

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* This outbreak was not reported to this office by the health officer of the "first" locality at th
it occurred.

PROPORTION OF MEASLES IN THE DIFFERENT MONTHS OF THE YEAR 1890.

Table 6 exhibits the proportion of measles reported in each month of the year 1890. The *first* line gives the per cent of all weekly postal-card *reports*, made by physicians in active general practice, which reported the presence of measles under their observation. The *second* line gives the average per cent of all these *reporters* who stated the presence of measles. The *third* line states the average order of prevalence of measles in the list of diseases reported. The *fourth* line represents the *prevalence* of measles, being a combination of the first and third lines of this table (the method of combining them is explained on pages 122–3 of the Annual Report of this Board for the year 1890). In this third line the smallest numbers indicate the greatest prevalence,—for instance, May is 1 or *first* in prevalence,—more measles in May than in any other month; June is 2 or *second* in prevalence; March is 3 or *third* in prevalence; and so on. The *fifth* line represents by months the number of outbreaks of measles reported to this office by health officers and clerks, including only the reports which gave the dates of outbreaks,—reports of 46 outbreaks did not give dates and, of course, those outbreaks could not be included in this line.

The evidence in the various lines of this table (6) seems to indicate that in Michigan measles is most prevalent in the first half of the calendar year, the maximum occurring about May or June and the minimum about August or September. But this evidence is only for a single year, and might, therefore, be exceptional. In Exhibit XX., page 137, of this Annual Report for 1891, is a statement of the average per cent of weekly card reports stating the presence of measles by months for the thirteen years 1877–89, from which it appears that the maximum occurs in May, and the minimum in October.

TABLE 6.—*Measles in Michigan during the year 1890, exhibiting, by months, the per cent of all weekly card-reports received which stated the presence of measles; the average per cent of all observers reporting weekly who reported measles; the average order of prevalence of measles where it was present; and the number of outbreaks reported by health officers and clerks of local boards of health.*

1890.	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Per cent of weekly card reports stating presence of measles	12	12	19	19	21	23	22	16	5	3	4	4	7
Average per cent of observers who reported measles present	22	18	29	31	29	35	37	30	12	7	8	6	17
Average order of prevalence where present	3.0	4.4	3.2	2.5	2.8	2.7	2.9	2.9	4.3	3.2	3.3	1.7	2.8
Prevalence*	8	9	5	3	4	1	2	6	12	11	10	7	8
Outbreaks	375	24	30	45	66	74	36	27	5	5	14	18	31

* Explained in the text accompanying this table.

WHOOPING-COUGH IN MICHIGAN.

DURING THE YEAR ENDING DECEMBER 31, 1890.

During the year ending Dec. 31, 1890, the occurrence of 983 cases of sickness, and 20 deaths from whooping-cough was reported to this office. The disease was reported to have prevailed in 93 localities, in 45 counties, with an average of 10.6 cases and 0.2 of one death per locality. About two per cent of the reported cases were said to have proved fatal. The greatest number of cases reported to have occurred in one locality, was 100, in the village of St. Johns, and the greatest mortality reported to have occurred in one locality was in the township of Ronald, Ionia county, where three out of five cases were reported to have proved fatal.

Relative to the source of contagium of the disease, it was reported in 24 instances as from a former case, in three instances as "epidemic," in 19 instances as "unknown," and in 47 instances no statement was made in regard to it.

Although there annually occur many cases of sickness and a considerable number of deaths, from this disease in Michigan, but little effort seems to be made towards its prevention or restriction. In only three instances, reports stated that isolation of those sick with the disease had been resorted to.

There seems to exist a very common feeling that whooping-cough is an infantile disease, which all children must sooner or later contract, and that it is not a very fatal disease.

While it is true that whooping-cough is not so frequent a cause of mortality as scarlet fever, diphtheria and typhoid fever; yet it should be borne in mind that it is a communicable disease which causes more deaths in Michigan than does small-pox, and that it is largely preventable.

If in the 93 localities where the disease occurred in this State in 1890, prompt isolation of first cases had been enforced, it is probable that 800 cases of sickness, and a large proportion of the twenty deaths which were caused by this disease would have been prevented, and the consequent suffering and expense avoided.

CONSUMPTION IN MICHIGAN.

DURING THE YEAR ENDING DECEMBER 31, 1890.

During the year 1890, two noteworthy communications relative to consumption, were received at this office; one from Gagetown, Tuscola county; and the other from Milford, Oakland county.

Dr. M. R. Lyman, health officer of the village of Gagetown, wrote to this office, March 17, 1890:

> "If I had 20 or 25 pamphlets on the cause and prevention of consumption, and also its contagiousness, I could use them to good advantage among the people here, and in this vicinity.
>
> "During my six years' residence in this place there has been a great increase in this dread disease, caused to a great extent by not using proper disinfectants, and in a great many cases none being used."

The documents asked for by Dr. Lyman were sent to him.

Consumption in the village of Milford, Oakland county.

Sept. 29, 1890, Dr. Robert Johnston, of the village of Milford, wrote to the Secretary of this Board as follows:

> "Dear Sir:—There have been several deaths from pulmonary consumption among the pupils who have attended our school during the past two years, and as I feared our building might be infected or unsafe, I had it thoroughly disinfected with bichloride of mercury. There is now in attendance a pupil from a family where there have been several fatal cases of phthisis. I circulated the Reports of the Pontiac Sanitary Convention sent me, and several of the pupils are afraid to attend in the room along with the pupil who is coughing and is suspected to have consumption. Can our school board *exclude* cases of consumption from school as we do cases of scarlet fever, diphtheria, etc.? I am quite sure there are other school-houses in our county that are unsafe, also churches and other public halls. Would it not be well for the State Board of Health to issue a circular to school boards and others having charge of churches and public buildings, showing the necessity for thorough disinfection and giving a *formula* and method for thorough (annual or semi-annual) disinfection?
>
> "Is phthisis officially considered to be communicable?"

In reply to Dr. Johnston's letter, the Secretary wrote to him, Sept. 30, 1890, as follows:

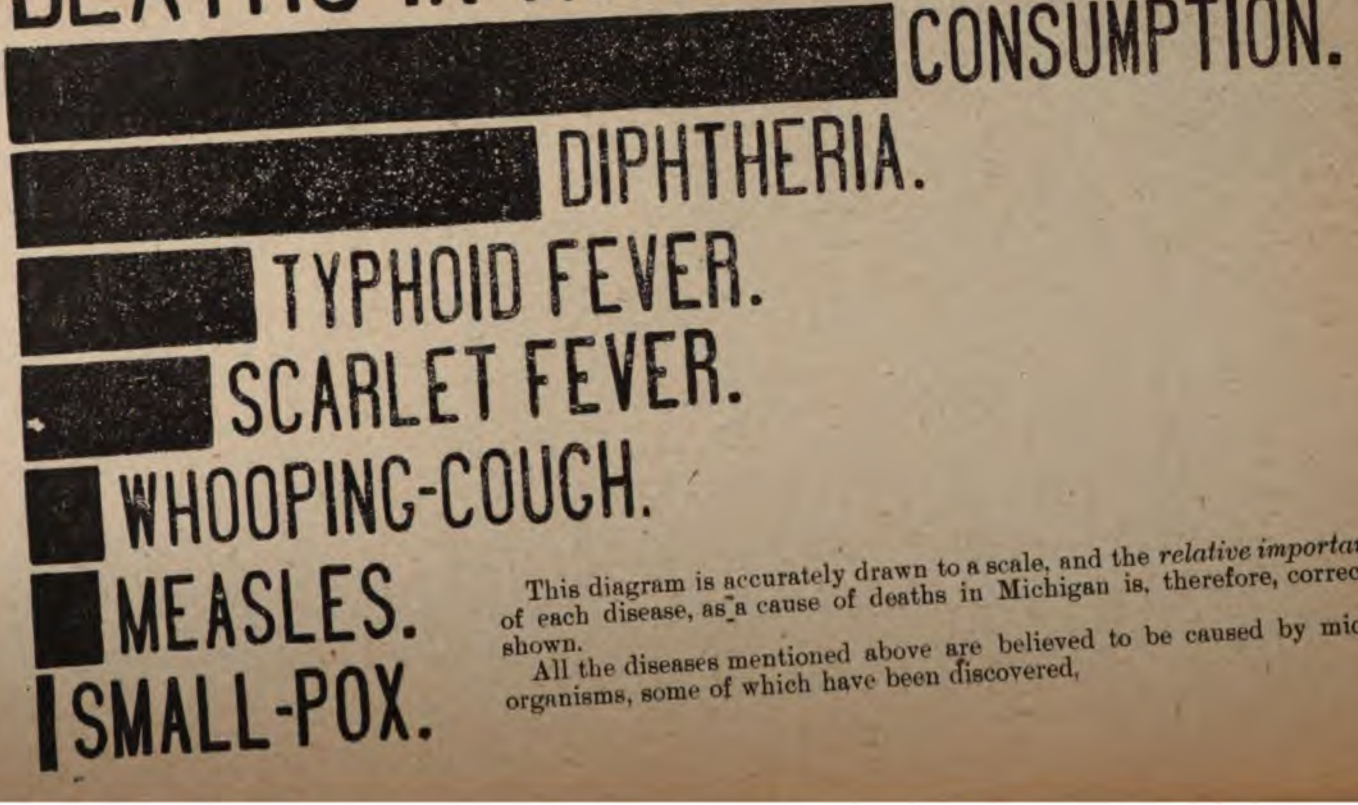
> "Please accept thanks for your letter of September 29. I will place the subject before this Board at the first opportunity.
>
> "In replying to your question 'Is phthisis (officially) communicable?' This Board has never voted on the subject; but my belief is that every member of the Board thinks it is a communicable disease.
>
> "I hardly think this Board is prepared to recommend the isolation of persons sick of phthisis. For a long time, however, it has recommended the disinfection of all sputa of consumptive patients. Much can be done to prevent its spread by providing for proper ventilation of school-rooms."

At the regular meeting of this Board, at the State Capitol, Oct. 14, 1890, the Secretary submitted Dr. Johnston's letter, and the subject to which it pertains, for the consideration of the Board. The action taken by the Board in regard thereto, is fully described in the published proceedings of the Board at said meeting, printed in the first part of this report.

Mention of these *two notable communications* relative to consumption, does not, by any means, imply that no other reports of consumption have been received at this office during the year. On the contrary, Tables III. and IV. of the article on the "Statistical Study of Sickness in Michigan in 1890," printed on pages 92 and 93 of this Report, show, that of the 4,939 weekly card-reports, made to this office, by 155 observers in different parts of the State, during the year 1890; 2,558, or 52 per cent of the whole, stated the presence of the disease (consumption) in the localities from which the reports were received; and also give evidence of similar prevalence of consumption throughout the State in former years. So that, although up to the present, health officers have not been required to report specific, individual cases of the disease to this office, as is usual in regard to other communicable diseases; yet there has been ample evidence of the prevalence of the disease in the State.

To further illustrate what has been said above in regard to the death-rate from consumption in Michigan; and to show the importance of efforts toward lessening the prevalence of that disease, the following diagram is here inserted. This diagram presents a comparative view of the proportionate numbers of deaths from seven communicable diseases in Michigan during the twelve-year period 1876–87, and shows that the mortality from consumption far exceeds that from any of the other diseases.

DEATHS IN MICHIGAN, 1876-'87.



This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan is, therefore, correctly shown.

All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered.

GLANDERS IN MICHIGAN, IN 1890.

During the year ending December 31, 1890, there were reported to this office 14 cases of glanders, from 7 localities, as follows:

Allegan, Allegan county, 3; Manistee, Manistee county, 3; Stetson, Oceana county, 1; Columbus, St. Clair county, 1; Bessemer, Gogebic county, 4; Gaines, Kent county, 1; Denmark township, Tuscola county, 1.

Extracts from communications received at this office relative to the above-mentioned outbreaks of glanders, and the action taken by this Board, and local health officials regarding them, are given below:

Glanders in Allegan, Allegan County.

Jan. 30, 1890, L. F. Stuck, M. D., health officer of Allegan, wrote to the Secretary of this Board as follows:

"The veterinarians of this place have reported to me three (3) cases of glanders *of the horse* in this vicinity, and I have reported the same to the local board; but no action has been taken to dispose of them. I am certain there can be no question as to diagnosis; but do not know what measures to pursue to abate the danger. One of the doctors informs me that he had informed the State Veterinarian some time ago, still nothing has been done. Will you please assist me by informing the State Veterinarian, or furnish me advice what to do?"

Feb. 1, 1890, the Secretary wrote to Dr. Stuck:

"In reply to your letter relative to glanders in your jurisdiction, I would say that the law now requires the reporting of all such diseases to the State Live Stock Commission. The president of this commission is Hon. H. H. Hinds, Stanton, Mich. I have sent him a copy of your letter, and would advise you to communicate with him."

Glanders at Manistee, Manistee County.

March 29, 1890, the following telegram was received by the Secretary of this Board, from Dr. James A. King, health officer of Manistee:

"We have here seventeen horses infected with mange, in three of which we suspect glanders. Please notify the State Veterinarian, and ask him to come here."

In reply to Dr. King, the Secretary wrote, March 31, 1890, as follows:

"I have telegraphed the president of the State Live Stock Commission, Hon. H. H. Hinds, Stanton, Mich., the substance of your telegram. I have also sent a notice to the State Veterinarian. The law now requires the notice to be given to the president of the State Live Stock Commission. The State Veterinarian cannot act until he is ordered to do so by the president of the Live Stock Commission."

Glanders in Stetson, Oceana County.

The following is copy of a letter which was received at this office with request that it be forwarded to the president of the State Live Stock Commission. The request was complied with:

"STETSON, *April 7, 1890.*

"*To the Live Stock Commissioner of Michigan:*

"SIR:—There is a horse in my jurisdiction reported by a horseman not a veterinarian. Said horse is believed to have the glanders. Said horse was purchased of one Wm. Blight of Holton, Muskegon Co. It is said that said Wm. Blight had a valuable team taken with this disease last summer and were killed by the authorities. I have been and viewed said horse and believe him to have the glanders. I shall serve a quarantine notice at once and wait your orders.

"Respectfully yours,

"CHAS. CONKLIN,

"*Health Officer of Leavitt, Oceana Co.*"

Glanders in Columbus Township, St. Clair County.

The following letter, dated June 13, 1890, was received at this office from John Wagner, health officer of Columbus township, St. Clair county:

> "There is a case of the sickness called the glanders in horses, at present in this township. Mr. Abraham Cornat, postoffice address Rattle Run, St. Clair county, Mich. He owns a horse sick with the glanders. The horse has been examined by a Mr. Kenzie, V. S., Pt. Huron, St. Clair county, Mich., and declared by him as sick with the glanders. I am afraid there are many more cases in this township. Please send us a competent officer to investigate the matter. The farm of Mr. Abraham Cornat is quarantined and his horses confined to his farm. We expect you to take prompt action or send instructions how to act. * *
>
> "I have sent a copy of this letter to the Hon. H. H. Hinds."

Glanders in Bessemer Township, Gogebic County.

Nov. 6, 1890, a telegram was received at this office from Geo. D. Slocum, health officer of the township of Bessemer, as follows:

> "Please notify State Veterinary Surgeon that glanders in horses exists here. Have him wire me."

On receipt of the above telegram, the Secretary of this Board telegraphed to Hon. H. H. Hinds, President of the State Live Stock Commission, as follows:

> "Doctor George D. Slocum, health officer, Bessemer, reports glanders in horses. Asks that you telegraph him."

Nov. 29, 1890, the following letter was received by the Secretary, from Dr. Slocum:

> "The four horses that had the glanders are dead and buried. I had the shed in which two of them were sick, torn down and burned. Since then I've heard that there has been some kicking by a few persons here, they claiming the destruction of the shed was uncalled for, and unnecessary. I've no doubt you will sanction my doing as I did. The two horses that were confined therein, were just rotten; and it would have been unsafe to let it remain, and perhaps contaminate persons or animals.
>
> "If you desire a further account of the cases, please let me know. * * * I await your further will and pleasure."

In response to Dr. Slocum's letter, the Secretary wrote to him, Dec. 2, 1890:

> "Please accept my thanks for your letter of November 29, concerning the outbreak of glanders in your jurisdiction. I congratulate you that the glandered horses are dead and buried, and that the shed in which they were kept has been burned. It would have been better if it had been burned, if possible, without tearing it down, because of the danger of the disease being communicated to those who tore it down. All posts or anything else to which the horses were hitched while having the disease should also be burned
>
> "I would be glad to get as full a report of this outbreak of glanders as you can give.
>
> "What did the State Live Stock Commission do in regard to it?
>
> "Did the State Veterinarian examine the horses and pronounce the disease glanders?"

In compliance with the Secretary's request, Dec. 5, 1890, Dr. Slocum sent the following report:

> "In regard to the cases of glanders that recently occurred in this place, I would say that the disease was brought from a wood and lumber camp a short distance from Hurley, Wis., where the horses were worked. Very soon after the horses were taken sick, they were brought here, where the owner resides. The first case was taken about Oct. 20, '90, and died Oct. 28, '90; the second case was taken Oct. 29, '90, and died Nov. 1, 1890; the third and fourth cases were taken about Nov. 2, '90, and the third horse was killed Nov. 10, '90, and the fourth was killed Nov. 21, '90. As soon as I became aware of any such disease being here, I thoroughly examined the two horses yet living, and diagnosing the disease as glanders, a rigid quarantine was established, and strictly maintained. During thirty years' practice, having seen no small number of cases of glanders and farcy, I had no hesitation in deciding the nature of the disease, or rather

in determining a name for it. This was fully coincided in by Dr. Geo. Le Loope, Chief Surgeon of Gogebic Hospital, at this place.

"The State Board of Health, and the President of the Live Stock Commission, were duly notified of the existence of such a disease here. From the former, instructions pertaining to quarantine, etc., were received, which had previously been executed, and subsequently were carried out to the letter. The local board of health were prompt and active in all the measures necessary to restrict the spread of the disease. H. H. Hinds, Esq., President of the Live Stock Commission, visited this place, seeing the last two horses, and coincided in the above-mentioned opinion of the nature of the disease, and in what had been done by the authorities here. He readily promised to send the State veterinarian here: but upon my assurance that everything should be thoroughly attended to and that such official could accomplish no particular object beyond assistance in the diagnosis of the disease, he deferred doing so until more urgent necessity required. As far as the manifestations of the disease—glanders and farcy—existed in these cases, there was nothing of any particular importance. In the first two horses symptoms of glanders predominated, while in the last two horses farcy symptoms predominated until a day or two before they were killed. The animals were removed about a mile from the city and buried thoroughly. The shed in which they had been, was contiguous to other buildings, which prevented its being destroyed except by tearing it down, which was done, and the whole burned, extreme care being taken to consume every portion thereof. No other cases of the disease have occurred as yet, and I think the prospect is that none will occur after the thorough measures taken to prevent it. There is one thing connected with these cases that might cause me to surmise that the disease was other than glanders and farcy, which is the brief time they were taken sick, to that of death; but from my own experience, and from all the facts I can learn of others of a much longer residence here, it is not an uncommon thing for that disease to run its course in a very much shorter time than in a warmer climate.

"Hoping this account of the cases here will meet your approbation, I am * * * *."

Glanders in Gaines Township, Kent County.

In regard to this outbreak of glanders, the health officer of the township, J. K. Hanna, M. D., simply reported, Dec. 19, 1890, that a case of glanders, in an old horse, existed in his jurisdiction; that danger of the spread of the disease was great owing to the animal not having been isolated; but that precautionary measures would be taken to prevent the spread of the disease.

Glanders in Denmark Township, Tuscola County.

The notice received relative to this outbreak of glanders, dated Dec. 27, 1890, was conveyed to this office by postal card from the health officer of Denmark township, Dr. George Reid, in which it occurred, and read as follows:

"A case of glanders was reported to me yesterday, 3 miles east of this place. Placed up a *notice* and telegraphed to Mr. Hinds, Stanton, Montcalm county, for instructions."

HYDROPHOBIA (RABIES) IN MICHIGAN, IN 1890.

During the year ending Dec. 31, 1890, there were reported to the Secretary of this Board, three outbreaks of this disease, in the following named localities in Michigan: Zilwaukee township, Saginaw county, 1; Merritt township, Bay county, 1; Benton township, Eaton county, 1.

Details relative to these outbreaks of hydrophobia are given below:

Rabies in Zilwaukee Township, Saginaw County.

The following letter, dated June 23, 1890, was received by the Secretary of this Board, from Dr. J. J. Lyon, health officer of Zilwaukee township, Saginaw county:

"We have had a dog killed here which has symptoms of rabies. It is claimed others have been bitten, and though we shall take every precaution as to this matter, we are anxious to know what the law will allow us to do, or how far we can go; as there is nothing mentioned in this connection in the 'Health Laws.' Will you let us know soon and oblige? * * *

"As I have no recent 'Health Laws,' will you please send me a copy, if there are any?"

June 24, 1890, the Secretary, replying to Dr. Lyon's letter, wrote:

"Please accept thanks for your letter of June 23, concerning hydrophobia in your jurisdiction. At your request, I send you by this mail, a copy of a pamphlet containing the health laws, in which I have marked paragraphs giving the law under which your board may act for the prevention of this dangerous disease. The local board of health is authorized to make such regulations relative to any cause of sickness within its jurisdiction as may be deemed necessary for the public safety.* Under this law your local board should make regulations relative to the muzzling of dogs, and should publish these regulations as required by law, in some newspaper, or by posting in five public places.

"As you will see from the pamphlet which I enclose, it is also necessary to report cases of hydrophobia to the State Live Stock Commission. The president of that commission is Hon. H. H. Hinds, Stanton, Mich."

June 30, 1890, A. W. McDowell, clerk of the board of health of Zilwaukee, wrote to the Secretary of this Board, as follows:

"The following is the action taken by the local board of health in regard to the case of hydrophobia in our township, of which you were duly notified. The board of health of the township of Zilwaukee met, this day, pursuant to law; present, J. J. Lyon, M. D., health officer; A. A. Harris, supervisor; Jno. H. Schroeder and Andrew P. Sumnerfield, justices; and A. W. McDowell, clerk. Following resolutions were passed for the placing or posting of eight notices to all owners or keepers of dogs in this township, for a period of at least three months from date of said notice, that dogs owned or kept by them shall be muzzled or chained for said length of time; also T. F. Casenrer was duly appointed and authorized by said board to personally notify all residents of said township of all requirements in this notice. * * *

"Any further instructions you can give us will be greatly appreciated by said board."

Rabies (suspected) in Merritt Township, Bay County.

The following letter, dated Oct. 14, 1890, was received at this office from Wm. Dawson, health officer of Merritt township, Bay county:

"SIR:—There has come to my notice a case of hydrophobia, in an ox owned by Hector Young, in the township of Merritt. The ox could not get up on his feet when I saw him, and could not live many hours longer. I and our supervisor advised that they knock him in the head, and burn him up, which they did. They could not give any information; but thought he was bitten by a dog afflicted with rabies."

Hydrophobia in Benton township, Eaton County.

A paragraph in the "Charlotte Republican," relative to this outbreak, having come to the knowledge of the Secretary of this Board, Nov. 24, 1890, the Secretary wrote to Dr. Lewis E. Higbee, health officer of the village of Potterville, asking information on the subject, as follows:

"The 'Charlotte Republican' of Nov. 21, contains the following:—

'Samuel Chandler, of Benton, died yesterday morning of hydrophobia. He was bitten by a dog in March, 1889, but no evil results were apparent until Monday evening, when he complained of feeling unwell. Tuesday he was taken with the first convulsions and rapidly grew worse until death ended his misery.'

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* § 1639 Howell's Statutes.

"Will you kindly give me whatever information you can concerning this subject."

In reply to the Secretary's letter, Dr. Higbee wrote, Nov. 25, 1890:

"Yours of Nov. 24, rec'd. In reply will say that Samuel Challender, of this township, is said to have died of hydrophobia. He lived, at the time of his last illness, about five miles from here. He was taken sick on Tuesday evening, Nov. 18, while at the supper table. He ate no supper, and the man where he lived noticed he was not well, and asked him what made him feel so dejected. He went into a violent passion, and threw the man on the floor a number of times. As soon as he could, he sent for a physician from Charlotte, Dr. Emery. He soon went into violent convulsions, but during the short intervals between the convulsions, he was sane and begged of them to kill him. The physician pronounced it hydrophobia, called counsel which sustained his diagnosis—they advised tying him to the bed, which was done, as he bit pieces of flesh from his arms, lips, etc. Is said to have looked like a dog. He neither ate, drank nor slept, after he was taken sick, until his death. Was taken sick Tuesday evening and died Thursday morning. His relatives say he was bitten fourteen years ago, and again two years ago, by the same dog. The dog had no symptoms of hydrophobia; but was of a surly disposition, and was killed soon after biting him two years ago. This same party was taken sick March 19, 1890, when I treated him. He was not very 'bright.' Was of a very nervous temperament. He had at that time what I thought hysteria. At times he would straighten out perfectly stiff; but would last but few minutes. He had been attending a 'no churchite' meeting, and claimed to have been converted to their belief. During his rational periods, he was constantly talking about religion. I was of the opinion his sickness was caused by his nervous excitement. I visited him three days in succession, when he fully recovered. Has been working ever since."

Supposed Rabies in Verona, Huron County.

From a paragraph which appeared in the "Huron Tribune" (Bad Axe) of March 22, 1890, it would appear that there was another suspected case of this disease, in Verona township, Huron county. The paragraph referred to was as follows:

"A dog, supposed to be mad, went through the eastern part of Verona. He came from Bingham and was pursued for some miles by Mr. McAllister and was afterwards seen by Charley Bateman at Thomas Scott's and on Sunday morning visited the barnyard of James Bateman, bit several geese and killed other fowls and bit their dog, but was followed by Charley Bateman and killed. Mr. Bateman has killed all the injured fowls and his dog and thinks he is comparatively safe from further injury."

ALLEGED ANTHRAX IN MICHIGAN IN 1890.

Alleged Anthrax near the Village of Union City.

Information having been received at this office of the occurrence of an outbreak of anthrax near the village of Union City, the Secretary of this Board wrote, Oct. 28, 1890, to Dr. E. Brumfield, health officer of that village, as follows:

"Report reaches this office that there is an outbreak of anthrax (malignant pustule) among horses in your vicinity, and that five horses have already died of the disease. As this disease is very dangerous to man as well as to horses, it is important that vigorous measures be taken to prevent its further spread. Anthrax is not indigenous to this country and it is important to know from what country it was imported. Will you therefore kindly answer the following questions:

"1. From what country was the anthrax contagium imported?*

"2. In what locality is the outbreak?

"3. What measures have been taken to prevent its further spread?

"4. What are the results of these measures?

"Any other information concerning this outbreak which you may be able to give me will be thankfully received."

In reply to the Secretary's letter, Dr. Brumfield wrote, Nov. 3, 1890:

"Dr. Reed, veterinarian, reported to me, on the farm owned by Geo. Canrike, one mile west of Union City, two cases of anthrax, which were duly reported to you. The State veterinarian came here with J. J. Woodman,† examined the horses and reported anthrax the cause of death of five horses. No more sick at this date. Sick horses were kept from all others. Supposed cause of sickness was drinking surface water where horses had been buried—a sort of horse burying ground. Horses that died with glanders have been buried there. I will refer you to E. A. A. Grange, Lansing; he can tell you more about the cases than I can."

Nov. 4, 1890, the Secretary wrote to Prof. E. A. A. Grange, State Veterinarian, as follows:

"Will you kindly inform this office on the following points concerning the outbreak of anthrax among horses near Union City, Michigan?

"1. In what township did the outbreak occur?

"2. Was the disease anthrax?

"3. From what country was the disease imported? I believe that anthrax most frequently comes to this country in imported wool and hides?

"4. What was done to restrict the spread of the disease?

"Any other information which you may be able to give concerning this outbreak will be thankfully received."

In response to the Secretary's letter, Prof. Grange wrote, Nov. 8, 1890, as follows:

"I could hardly make a report to your office of an official nature that would answer the main questions of your communication, because all I could learn concerning the disease was second hand, that is, I was told about the symptoms, etc. I did not see the affected animals, they being dead before I got there; but I must say it looked very much like one of the forms of anthrax, from the description I received.

"Instructions have been left to wire me if any more cases come to light, and it will give me great pleasure to furnish your office with any information I can should the disease again make its appearance."

LUMP-JAW (ACTINOMYCOSIS) IN CATTLE, IN MICHIGAN, IN 1890.

Notice of one case of this disease was received at this office during the year 1890. It was reported from McBride, Montcalm county, and was said to have occurred in an ox, whose owner traded it to a person in Stanton, after it had contracted the disease.

On receipt of information of this case, the Secretary of this Board immediately wrote to the President of the State Live Stock Commission as follows:

"A letter just received states that an ox with lump-jaw has been traced to Lew Sterling, of Stanton. * * * I understand that the farmer who traded it to Mr. Sterling knew it had the lump-jaw."

Nothing further was learned of this case.

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* "It must have been imported from some foreign country, although it may have come to your place from some part of this country. I believe it most frequently comes in foreign wool or hides. Have you a woolen mill at your place? Does it receive wool from abroad? Was there any relation of this disease to it, traced?"

† Member State Live Stock Commission.

TYROTOXICON POISONING IN MICHIGAN IN 1890.

During the year ending Dec. 31, 1890, information relative to four instances of suspected tyrotoxicon poisoning was received at this office, in which 76 cases of sickness from this cause were reported to have occurred, as follows: Union City, Branch county, 50; Mendon, St. Joseph county, 6; Pentwater, Oceana county, 15; Detroit, Wayne county, 5.

Suspected Tyrotoxicon Poisoning in Union City.

The following letter, dated June 3, 1890, was received at this office, from Dr. E. Brumfield, health officer of the village of Union City:

> "A disease with purging, vomiting, pain and burning in stomach, with fever, vomiting matter and blood. The cause I think is tyrotoxicon poison, from milk which had been put in can before the animal heat had been expelled. About fifty persons are sick; all of whom had been using milk from the dairy of E. B—, who has strained the milk in a ten gallon can, brought it to town, sold it before cooling.
>
> "No other cases have been reported but the ones using milk from the above dairy.
>
> "I have seen Mr. B—. He has promised to cool the milk and bring it in good condition. He has a fine dairy, and will do the best he can."

In reply to Dr. Brumfield's letter, the Secretary of this Board wrote, June 5, 1890:

> "Please accept thanks for your letter of June 3, reporting the cases of sickness attributed to tyrotoxicon.
>
> "If you can obtain some of the milk which caused the sickness, I wish you would send me a sample for analysis."

June 10, 1890, Mr. E. E. Bostwick, owner of the dairy from which the supposed infected milk, referred to above, was obtained, wrote to the Secretary of this Board, as follows:

> "I notice by the last Union City Local, that a sample of milk, purporting to be from my dairy, has been sent to you for analysis. I do not know where Dr. Brumfield obtained the milk he sent to you, or in what condition it was sent. I know only this, that the milk given to Prof. Hewitt for analysis here, had been in the hands of three or four different persons, that it was carried about in one person's pocket, for exhibition, on the streets, corked up in a glass bottle, the day being so warm that the milk had become almost entirely loppered. At one time, I understand, Prof. Hewitt refused to go on with the analysis, for the reason that the milk was obtained from a hotel where I never sell milk; yet there had been sickness at this same hotel. I have not said a word to Prof. Hewitt about the milk, although a personal friend, as I would seek in no way to influence him. I only write you that you may know some of the facts concerning the matter. Dr. Brumfield has pronounced the milk poisonous, before making any analysis whatever. I called his attention to the fact that there were several cases of sickness where other milk was used; but he paid no attention to the matter. I also told him of a large quantity of strawberries shipped here from southern Ill., in such decayed condition that many refused to buy them, as they had been stopped on the R. R. over Sunday. The day these berries were sold in our market (Monday June 2) was the day my milk was called poisonous. As far as I know, no notice has been paid to the diseased fruit. I have a fine herd of jerseys, towards 40 head all told, and a large share full-blood, 17 cows being in milk. My stables are kept clean, the cows are on fresh grass, timothy and clover, and have each about 2 qts. of oat meal twice a day. They have only well water to drink, and plenty of it pumped by wind power.
>
> "I am supplying 90 families with milk, embracing probably between 400 and 500 people, or nearly half the town. These families are nearly all of the first class of our people, and only two or three have been frightened away from us by the sensational reports. Many of the sick trace their trouble to the soured strawberries, and few charge it to the milk.
>
> "Our milk boy took account of 82 of his milk customers yesterday and found but 14 had been sick. These were just as he came to them, and I have directed him to pursue his investigations, which if you

wish I will report to you. I have so far paid but little attention to this matter for the reason that it would clear itself up after a little, and besides I have the care of a 600-acre farm along with the office of Supervisor of the township.

"I knew I had taken all care to have the milk in good shape, and I could not see how there could be anything wrong about it."

June 11, 1890, the Secretary of this Board wrote to Dr. Joseph Baker, of Union City, as follows:

"*Dr. Joseph Baker, Union City, Michigan:*

"DEAR SIR—I understand that some of the persons taken suddenly sick with symptoms similar to cholera morbus, about June 2, 1890, were treated by you. Will you have the kindness to supply this office with information on the subject?

"Enclosed please find stamped envelope for your reply.

"The points on which information is desired are as follows:—

"1. What was the nature of the sickness?

"2. How many persons were sick?

"3. Just when,—that is, at what hour and what day were the greater number of persons taken sick?

"4. How many of them had drunk milk which had not been boiled or heated (because heating it would destroy tyrotoxicon)?

"5. How long after taking the milk before the sickness occurred?

"6. What proportion of those sick had taken fermented or "stale" strawberries? (It is alleged that such berries were sold there, June 2.)

"7. How long after taking the strawberries before the sickness occurred?

"8. If within your knowledge, what was the mode of dealing with the milk from the time it was taken from the cow until it was delivered to customers?

"Very respectfully,

"HENRY B. BAKER,

"*Secretary.*"

In reply to the Secretary's letter, Dr. Timothy Baker wrote June 14, as follows:

"Your favor of the 11th inst. directed to Dr. *Joseph* Baker, was handed to me by our postmaster, supposing it to be an error in name, there being no one of that christian name in our town, therefore I take the liberty of sending the following replies to your interrogatories:—

"1st. The sickness bore a close resemblance to cholera morbus. It attacked the patients suddenly and consisted of vomiting and purging, spasmodic pains in the abdomen, and rapid loss of strength. Thirst was great but cold water was vomited as soon as swallowed. The vomitus at first in some of the cases consisted of curdled milk, afterwards of bile; but no appearance of rice water.

"2d. As nearly as I can ascertain, about 50 persons who partook of Mr. Bostwick's milk were sick—being only one in six or seven who used it.

"4th. Several who were most severely affected, only partook of an amount sufficient to flavor their coffee or tea.

"5th. Only a few hours.

"6th. I cannot answer.

"7th. I cannot answer.

"8th. Not within my knowledge; but Mr. E. E. Bostwick will undoubtedly give you information on all these points if requested to do so; and I take pleasure in saying that he is a reliable christian gentleman, whose statements may be implicitly relied on.

"If it was the milk which produced this sickness, it operated very strangely.

"My family consisting of five persons, used two quarts of the milk, without perceiving any unpleasant effect.

"I am credibly informed that four or five persons who had milk from another milk dealer, were affected in the same manner as those who used Bostwick's milk.

"On the 9th inst., two persons who went from this place to Coldwater, and ate pretty freely of cheese and bologna sausage, were attacked in the same manner as those who used the alleged poisoned milk."

"P. S. Since writing the paper to which this is annexed, I have had my attention called to the proceedings of the State Board of Health at the regular meeting Oct. 11, 1887.

"I can see no analogy between the case there reported and the one under investigation.

"I can find no evidence of the discovery or existence of tyrotoxicon in milk examined and tested within 12 hours from the time it is milked from the cow, she running in good pasture.

"It is asserted here that boiling water will not destroy the germ of tyrotoxicon. Is this true?"

In response to Dr. Baker's letter, the Secretary wrote June 17:

"Please accept thanks for your letter of June 14. By this mail I send you two pamphlets on the restriction and prevention of cholera infantum, cholera morbus, etc.

"Inasmuch as it is not yet certainly known just what germ causes tyrotoxicon, whether it is the bacillus butyricus or not, I cannot certainly say whether boiling the milk will destroy it. However, I think that experiments in sterilizing, prove that boiling the milk destroys all the germs. Boiling water if kept in contact long enough will undoubtedly destroy all the germs."

In reply to Mr. Bostwick's letter of June 10, 1890, the Secretary wrote to him June 11, as follows:

"I shall be glad to have any facts bearing on the recent sickness in Union City, attributed to poisonous milk, but which you suggest may be attributable to decayed strawberries.

"You suggest that you may be able to get some facts from your customers. Accordingly I send you a separate letter asking for any facts which you may be able to give.

"By this mail I send you articles published by this board on the subject of tyrotoxicon."

The *separate* letter referred to by the Secretary in the last preceding letter, is printed below. This letter contains a series of questions propounded by the Secretary; and was returned to this office by Mr. Bostwick, with his replies opposite to the questions. Said replies are printed in italics:

LANSING, MICH., *June 11, 1890.*

To E. E. Bostwick, Dairyman, Union City, Michigan:

"DEAR SIR—I am informed that the recent outbreak of acute sickness in Union City has been attributed to tyrotoxicon poisoning, from milk which came from your dairy. The sickness has also been attributed to decayed strawberries sold in Union City, Monday, June 2. Will you have the kindness to supply this office with any information on this subject which you may be able to give?

"Enclosed please find stamped envelope for your response.

"The points on which I especially want information are the following:

"1. How many persons were sick? *Fifty-three out of nearly 400 customers.*

"2. Just when, that is, at what hour and what day were the greater number of persons taken sick? *Forenoon of Tuesday.*

"3. How many of them had drunk milk that had not been boiled or heated (because heating it would destroy tyrotoxicon)? *Not known.*

"4. What was the nature of the sickness? *Cholera morbus.*

"5. How long after taking the milk before the sickness occurred? *Six to 12 hours.*

"6. What proportion of those sick had taken fermented or 'stale' strawberries? *About two-thirds.*

"6½. How long after taking the strawberries before the sickness occurred?

"7. What was the mode of dealing with the milk from the time it was taken from the cow until it was delivered to the customers? *Usual mode, as given in letter.*

"8. What will be your method of dealing with milk hereafter? *Cooling, ventilation, as per letter.*

"Very respectfully,

"HENRY B. BAKER,

Secretary."

Replying to the Secretary's letter of June 10, as given above, Dr. E. Brumfield wrote June 12, 1890:

"Yours of the 11th at hand. I will try to give you all the facts as they occurred. I was called to visit Mrs. Mann June 3d, at 11 o'clock, A. M. Found her with nausea and vomiting, dryness of throat, burning in stomach, pain in abdomen, with watery stools. The vomit thin, not unlike soap suds, of a reddish color, pain in back, also pain in back of the head-occipital. Vomiting lasted three or four hours. All patients sleepy, very thirsty, pulse 100, temperature 102°.

"Mrs. Mann did not eat any strawberries.

"In the family of Wm. H. Hubbard, four were sick. As above, they did not eat strawberries. In

George Haltzel's family three were sick, no berries. J. Jeffery's family two sick, no berries. Russell Braum's family two sick, no berries. Geo. Swarthout's family, three sick, no berries. I cannot find that any were sick from berries unless they had used cream or milk on them.

"Patients were all taken sick from two to three hours after the morning meal. Some used the milk in tea, others on oatmeal, some on berries. No sickness, of the above symptoms, but those that took milk.

"Joseph Jeffery gave some milk to a cat to see if it would make the cat sick. He said the cat vomited, was very sick; would not eat any milk since. He thinks she will die. About fifty persons were sick, most of them were taken sick June 3d, from 9 to 12, A. M. The names given here did not boil the milk. Some people here used milk from the same dairy, were not sick. Do not know the reason why they were not sick. They may have boiled it. The symptoms of Mrs. Mann were in all cases that I visited, the same, which was eighteen. I am sure it was poison in some form. I have no doubt but Prof. Vaughan will find tyrotoxicon in sample. Patients not well yet; they complain of weakness, pain in limbs and back, dryness of throat, sleepy, cannot eat anything without distressing them. Mr. Bostwick is trying to charge this sickness to berries, but it is not so. This is sickness from milk, I think, without doubt.

"Mr. Bostwick told me he strained the milk in a ten-gallon can, as soon as he milked, before the animal heat was out, shut the can tight, brought it to town."

In response to the Secretary's first letter, of June 11, 1890, as quoted above, Mr. Bostwick wrote, June 13, as follows:

"Yours of the 11th received. I have only to say that nothing new has developed regarding the sudden outbreak of sickness of last week, and indeed I do not know of any further inquiry into the matter. * * * * Nearly all our customers attribute the trouble to causes other than the milk, as sour berries, extreme heat of the atmosphere, etc. The matter of the weather I have not before spoken of: but on Monday afternoon, June 2, the mercury rose rapidly to 85° and during the night following a heavy electric storm passed over, with oppressive heat. Some of our people consider this the sole cause of the sickness and predict that such a thing would not happen once in a hundred years.

"Our milk being largely from full-blood Jerseys, is very rich, and possibly is more susceptible to an extreme electrical condition of atmosphere. Of this I cannot tell. On the Monday afternoon of June 2d our cows were milked in tin pails, holding about 12 quarts. The milk was then strained into a large tin tank, through a cloth strainer placed over a fine wire strainer. The milk was then dipped into the delivery cans, which were closed with a tight cover. This has been our uniform method, and I had never thought there could be trouble from close cans, as the milk by standing in open pails and then being dipped out after straining, with a quart dipper, would have a good chance to cool. Besides the dairy is but one and one-half miles from town and the milk is usually delivered within two hours from the time of milking.

"In two years of milk business, I have never had any trouble whatever before this, as I have taken all pains to have everything right. Our cans are scalded twice each day and cooled with covers off. Pails in the same way. You ask 'what will be your method of dealing with milk hereafter?' In reply, I can only say that I can see no chance for the better; unless it be to cool the milk by placing it in cold water, which I am now doing, and shall continue to do, during the warm weather. Also ventilating the cans. While I cannot say, yet I do not believe that any trouble on Monday, June 2d, arose from heated milk, as the milk on that day had unusual chance to cool, since the cows were milked by one man, the milking taking nearly two hours, while the usual time by two men is one hour. That day I could spare but one man, and he told me that the cows came on a walk to the stables, and that everything was as usual. * * *

"I have written you at some length, that you may know the true condition of things. I want to put everything in as clear light as possible, for I have nothing to conceal.

"I want to thank you for your careful method of procedure, for I now feel assured you will pass no hasty judgment in the case. * * *

"Regarding the number who partook of strawberries, I cannot say positively; but think over two-thirds. At the time of the trouble the milkman said nearly all of the customers had berries on Monday night. If I can help you to any more light, let me know."

The following letter, dated June 14, also, was received by the Secretary, from Mr. Bostwick:

"You will pardon me for another word regarding the milk question.

"I was told at the printing office last evening that the board of health here sent in a statement that the milk had been kept in a bottle in the office of one of our physicians, and that it was sent from that office to the State Board.

"I was also told that the milk was kept three days before sending it. Besides I know that the family from which the milk was taken has at least very poor facilities for keeping milk, having no ice, and I think no well. Do not think me over inclined to fault finding; but I hardly feel that it is fair play. * *

"If it would give you any more light, I might say that many who drank freely of the milk were not sick at all, while some who used little, in tea or coffee, were quite sick. On the other hand, a lady (Mrs. Isaac Tower), took milk of us the same night (June 2d) for a party, and reported none sick, though used in coffee. Pardon me for troubling you again."

Replying to Mr. Bostwick's letters, the Secretary wrote June 14, two letters as follows:

"Please accept cordial thanks for your letter concerning poisoning by supposed tyrotoxicon.

"The milk should not be kept where dust can gain entrance to it, because the tyrotoxicon is due to a fermentation produced by the growth of a germ which gains access to the milk in this manner. I send you herewith, in separate envelope, a pamphlet published by this Board which will explain more at length how tyrotoxicon is formed, and which gives rules for the protection of the milk. You will see the great importance of cooling the milk, when you study the way in which the ferment acts."

"In case there should be any similar occurrence in the future allow me to suggest, that in justice to your patrons, as well as to yourself, you should at once furnish us with a sample of the milk. I suppose it is now too late, but I very much regret that we did not have a sample in time for analysis. I have not yet heard from the analysis of the sample received."

June 17, 1890, Mr. Bostwick again wrote to the Secretary as follows:

"I received a line from you last night, also a paper by Dr. Vaughan, upon tyrotoxicon in milk, with rules for prevention. There is nothing in the rules that I have not observed, save the matter of cooling before distributing to customers. I am confident that in the way we have handled milk heretofore, by straining it from pails into a cool tin tank and then dipping by a quart dipper, into the distributing cans, the milk has been as low as 60° in temperature, uniformly.

"In looking over the other circulars, sent last week, I see nothing in statements of cases of milk poisoning, that are at all parallel with my case. In the instances of poisoning reported every one taking of the milk was affected, and those who died from its effects were sick for several days, while in the trouble here only one out of seven or eight were affected at all, and those who were sick were out in a few hours, for instance, children who were sick at noon Tuesday were out playing in the yards before night.

"Then again, those who took only a little milk in tea or coffee were affected worse than those who took of it freely. If this is a case of milk poisoning, it surely overthrows all former theories of poisoning as set forth in the pamphlets. I trust that you will take into account, in analyzing the milk sent you, the fact that it was exposed, by the length of time it remained here and in the way it was handled, to those *very conditions* which the pamphlets declared were conducive to tyrotoxicon. I have all confidence that you will deal fairly by me in this matter."

June 23, 1890, Dr. Brumfield again wrote to the Secretary as follows:

"I see by the Union City papers we are not to have an analysis of the milk I sent you. For what reason I do not know. Is it because Mr. Bostwick requested it should not be given to the public? I will send you a clipping from Union City Local. Now in justice to myself and the people of Union City, I ask that analysis be made of the milk I sent you, to be made public; also a copy of the letters sent you and Prof. Vaughan, from E. Bostwick. Let us have a fair investigation. Not wishing to do an injustice to Mr. Bostwick, I think the State Board should stand by the Local Health Officers in what is right. I have plenty of evidence to prove the course I have taken. I will send you the statement of Mrs. Vaughn of Union City in regard to the milk sent you for analysis. I am bound to see the end of this matter if possible."

Following is the clipping from the local paper referred to by Dr. Brumfield:

"In justice to E. E. Bostwick, and to counteract the false rumors in regard to the finding of tyrotoxicon poison in his milk, it might be well to state that although citizens who were taken sick showed decided symptoms of tyrotoxicon poisoning, still no analysis of the milk has been completed to prove it. In fact it was found impracticable to make an analysis on account of the undoubted natural chemical changes which had taken place before being suspected as the source of poisoning."

The statement of Mrs. Vaughn, mentioned by Dr. Brumfield, is as follows:

"Union City, June 23, '90. I live in Union City, Mich. My family consists of four children and myself. I buy milk of E. Bostwick. I bought one quart of milk June 2, '90, of E. Bostwick, night's milk. I and three of my children drank milk for supper. Between nine and ten o'clock P. M., three of the children and myself were taken very sick. I thought three of my children would die. Vomiting and diarrhœa, pain, dryness of throat, sleepy, laying with the eyes partly closed, looking as if they were dead. Dr. H. F. Ewers was called about two o'clock, June 3, A. M. I gave him about one-half pint of the milk left from supper. The same we had for our supper. He put it in a pint bottle (the same milk and bottle I sent you. It had been kept in a cool place up to the time I sent it to you.) [E. Brumfield.]

"One of the children did not eat milk and was not sick; but partook of the same food as the rest for supper. We had no strawberries that day. The milk Dr. Ewers had was put in a bottle less than nine hours after receiving it from the milk man."

In response to Dr. Brumfield's letter the Secretary wrote, June 24:

"Please accept cordial thanks for your letter of June 23, with enclosure giving statement of Mrs. George Vaughan. I think the item from the newspaper is probably an error. I have not received a statement of the analysis; but expect to receive it."

Dr. Brumfield again wrote to the Secretary of this Board July 9, 1890, as follows:

"Will you please answer the following questions?

"1. Were the symptoms sent you those of tyrotoxicon?

"2. Could milk generate tyrotoxicon in one-half hour after receiving it from the milkman?

"3. Would healthy milk cause fifty persons to become sick all within one hour's time?

"4. If it was not tyrotoxicon sickness what was it?

"5. If Prof. Vaughan did not find tyrotoxicon in sample why should he refrain from giving analysis?

"6. Should the request of one man be granted and the demands of the public be ignored?

"The people of Union City are asking for a report which I promised as soon as I could get a report from you. I found evidence of tyrotoxicon in the milk of E. E. Bostwick of June 2. I understand by request of E. E. Bostwick, Prof. Vaughan refuses to give the results of analysis. I do not like to be handicapped in this matter."

July 16, 1890, the Secretary wrote to Dr. Brumfield, in answer to his letter of July 9, as follows:

"In reply to your letter of July 9, my recollection is that the symptoms which you described were those of tyrotoxicon poisoning. I do not believe that Prof. Vaughan would withhold the analysis because of the request of any dairyman. I have this day written him again for it. He has been away from Ann Arbor, and I presume that is the reason of the delay. He is now at Old Mission, Michigan."

When the last-quoted letter from Dr. Brumfield was received at this office, the Secretary of this Board was absent, attending a sanitary convention. On his return, he wrote to Prof. Vaughan (July 16) as follows:

"Will you have the kindness to report relative to the sample of milk from Union City, Mich., sent to you, some time ago, by this office for test for tyrotoxicon. I regard it as quite important that we have the result of the test, especially as it is charged at Union City that, by request of E. E. Bostwick, dairyman of Union City, interested in a money way, Prof. Vaughan refuses to give the result of the analysis to the State Board of Health."

In reply to the Secretary's letter, Dr. Vaughan wrote to the Secretary, July 20, as follows:

"In regard to the milk sent from Union City, Mr. Bostwick wrote me asking if the analysis would be of any value after it had been obtained. I told him that it would be of no value, and for that reason I had not examined it. You will doubtlessly agree with me that Mr. B. could have claimed that the analysis was of no value, and could have proved his claim from my own writing on the subject. I was very busy, and thought it would be best to spend my time on something else."

After the receipt of Dr. Vaughan's letter, above quoted, the Secretary again wrote to Dr. Brumfield, July 28, 1890, telling him that "I have learned that you were right about the milk not having been examined by Prof. Vaughan," and transmitting to Dr. Brumfield the extract from Prof. Vaughan's letter, which is printed above, and which explains the reasons why.

After all, the chemical test was not essential in this instance in order to reach the conclusion that the poisoning was probably due to changes in the milk used such as form a compound similar to or identical with that which has been termed "tyrotoxicon." Because the other tests seem to prove this. And the most of the milk used in such cases of poisoning seems to have been that supplied by one dairyman. Even if it be supposed that the germs were in the milk when delivered, that the poisonous changes in the milk occurred before it left the care of the dairyman is not certain. Only a small proportion of those who used that milk were made sick, so that it is possible that the changes took place after the milk was delivered by the dairyman, and the milk developed poisonous qualities only where it was not kept in a cold place. It is alleged that the weather was very trying to milk, being not only very warm but an electrical storm occurring Monday night.

The purpose of collecting and publishing the facts in all such instances of suffering, is to lead to the prevention of such occurrences in the future. We have the assurance of the dairyman that hereafter great care will be taken at his dairy to keep milk cool and free from danger of poisonous changes. In this instance, the evidence should also be a caution to all users of milk to exercise great care in storing it in cool places.

Cheese Poisoning at Mendon, St. Joseph County.

June 21, 1890, Dr. E. Stewart, health officer of the village of Mendon, St. Joseph county, reported to this office as follows:

"Three cases of cheese poisoning. Dr. Nihart called. Does he report?

On receipt of Dr. Stewart's report, the Secretary wrote to him, June 30, 1890, as follows:

"Please accept thanks for your card concerning cheese poisoning. No, Dr. Nihart has not reported to this office. I should be glad to receive from you as health officer an account of the poisoning."

July 1, 1890, Dr. Stewart, replying to the Secretary's letter, wrote:

"Yours in relation to the cheese poisoning cases is received.

"The grocer here tells the story this way: About two weeks ago two young men bought some bologna at the market, went into the next door and bought cheese. After eating, both were sick and laid it to the bologna. A few days later the grocer who sold the cheese took some into his own family. He and the hired girl, one of the children and a boarder were sick. The boarder sent for the doctor. The grocer did not call a doctor, because, as he says, he suspected the cheese since the young men ate it. The sickness was not severe, I think, because it did not lay them up. He boxed up the remainder of the cheese, and wrote to the dealer about it, and received answer that he had written to the manufacturer.

"That I believe is all I know."

July 2, 1890, the Secretary, responding to Dr. Stewart's letter, wrote:

"Please accept thanks for your letter of July 1, relative to cheese poisoning. If convenient, I wish I could have a sample of the cheese for the purpose of having it tested."

A sample of the cheese could not be obtained.

Suspected Cheese Poisoning at Pentwater.

September 19, 1890, G. O. Switzer, health officer of Pentwater, Oceana county, wrote to this office as follows:

> "There have been quite a large number of cases of sickness in this village during the last two days, that are a little peculiar, and the cause I can hardly understand, unless it be tyrotoxicon, or something of that nature. In every case the patient had eaten cheese a short time before the attack. The symptoms were the same in every case. The attack came on suddenly, there was violent vomiting and purging, with considerable prostration for three or four hours and then gradual recovery. So far I have seen or heard from six different families, in which one or more have been sick, about 15 persons in all. Each one had eaten of cheese bought at a grocery in this village. Every one so far as I can learn, who ate of that cheese has been sick. I have procured a sample of the cheese, and would like to have it examined. Will you please inform me how or where I can have it done?"

A sample of the cheese mentioned in Dr. Switzer's letter was sent to Prof. Vaughan, Ann Arbor, for analysis, but no report of its examination has been received at this office.

Tyrotoxicon Poisoning in Detroit.

The following paragraph appeared in the Detroit Tribune of Nov. 19, 1890:

> "POISONED BY MILK.
>
> "Dr. James Cleland, Jr., was called to 244 Merrick avenue yesterday afternoon, where he found five of the family of William W. May suffering from tyrotoxicon poisoning. They were all in great pain, but the doctor worked with them all the afternoon and evening and at last was able to pronounce them out of danger.
>
> "The family consists of the father and mother and six children. The children were all sick except the eldest, and the only thing that would have produced the illness was some milk, of which they had partaken heartily and which those who were not attacked had not touched. At a late hour last night Dr. Cleland said he did not think the poisoning would be attended by any serious consequences. He intends to have a sample of the milk analyzed."

This paragraph having come to the notice of the Secretary of this Board, he wrote to Dr. Cleland, Nov. 19, 1890, as follows:

> "The Detroit Tribune of Nov. 19, contains a notice of five cases of poisoning by tyrotoxicon in the family of William W. May, 244 Merrick avenue, being treated by you. The notice states that you intend to have a sample of the milk, supposed to contain the tyrotoxicon, analyzed. Will you kindly send me a copy of the results of the analysis when it is made? * * * I suppose the 'analysis' will consist of the tests for tyrotoxicon."

In reply to the Secretary's letter, Dr. Cleland wrote Nov. 20, 1890:

> "Will send you analysis of milk and report of case, as soon as completed."

The promised report has not been received at this office.

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED BY THE USE OF KEROSENE, IN MICHIGAN, DURING THE YEAR ENDING DECEMBER 31, 1890.

Continuing a practice pursued in previous years, the office of the Secretary of the State Board of Health, has, during the year 1890, sought to obtain information relative to each casualty, alleged to have been caused by the use of kerosene, which came to the notice of said office.

The principal sources from which this office obtains facts in regard to such casualties as above mentioned, are four, viz.: from reports by the Fire Marshal of Detroit, State Inspectors of Illuminating Oils, Local Health Officers, and from newspaper reports. The data collected from these sources, show that during the year 1890, information was received at this office, of the occurrence of 55 casualties consequent on the use of kerosene in Michigan. These casualties were reported to have occurred in 13 localities, causing loss of two lives, injury (non-fatal), to 3 persons, and damage to property to the amount of $18,282.00.

This reported damage, does not include all the actual pecuniary loss occasioned by the above mentioned casualties, because in very many instances where houses, barns, and other property were destroyed, the loss was not reported.

The following tables and extracts from correspondence, show the localities in which the alleged casualties occurred, the nature of each casualty, the damage caused thereby, and whatever other details in regard to them this office has been able to collect.

Throughout the year 1890, the legal test for illuminating oil in Michigan was a "flash" test at one hundred and twenty degrees Fah. in a closed tester, approved by the State Board of Health.

TABLE 1.—*Casualties in Michigan during the year 1890, believed to have been consequent on the use of Kerosene, information of which was received at the Office of the Secretary of the State Board of Health. In this year the legal test was a Flash Test at 120 degrees Fah., in a closed tester.*

	Number of Casualties.	Number of Localities.	Pecuniary losses. Dollars.	Lives lost.	Persons injured (not fatally).
In Detroit	43	1	$18,282	0	0
In State (outside Detroit)	12	12	Not reported.	2	3
Totals	55	13	$18,282	2	3

List of Casualties Consequent on the use of Kerosene, in Detroit, Calendar Year, 1890.
(Supplied by William H. Baxter, Fire Marshal in Detroit.)

Date.	Street and Number.	Nature of Casualty.	Amount of Damage.
Jan. 2	76 Macomb	Overflowing lamp	
Jan. 5	155 Napoleon	Lamp explosion	$48.00
Jan. 6	14 Locust	Lamp explosion	
Jan. 21	81-83 Croghan	Overheated stove	285.00
Feb. 28	252 First	Lamp explosion	890.00
Mar. 8	69 Monroe	Stove explosion	15.00
Mar. 23	198 Seventeenth	Lamp explosion	150.00
Apr. 10	181 River	Stove explosion	90.00
Apr. 14	202 Cass	Lamp explosion	50.00
Apr. 18	1429 Michigan	Falling of lamp	
Apr. 18	117 St. Joseph	Falling of lamp	500.00
May 5	86½ Park	Stove explosion	50.00
May 18	88 Myrtle	Stove explosion	400.00
May 25	10 Thirty-second	Lamp explosion	745.00
June 3	68 Baltimore E.	Lamp explosion	
June 9	33-35 Galbert	Lamp explosion	686.00
June 19	358 Riopelle	Stove explosion	
June 24	282 Orleans	Lamp explosion	900.00
July 19	230 Houmboldt	Leaking stove	
July 20	260 Bagg	Lamp explosion	280.00
July 21	373 Townsend	Lamp explosion	1,496.00
July 28	687 Clinton	Overflowing stove	684.00
Aug. 10	531 Sixth	Lamp explosion	
Aug. 23	35 Monroe	Falling of lamp	
Aug. 28	193 Waterloo	Careless use of lamp	
Sept. 2	41 Beech	Overflowing stove	
Sept. 20	280 Williams	Careless use of lamp	
Sept. 24	45 Adams E.	Lamp held too close to clothing	1,049.00
Sept. 25	287 Clinton	Stove explosion	365.00
Sept. 30	35 Center	Lighting fire with oil	
Oct. 6	Steam barge in river	Lamp explosion	6,113.00
Oct. 11	115 Twelfth	Careless use of lamp	10.00
Oct. 15	154 Maple	Overflowing stove	15.00
Nov. 3	57 Wilcox	Stove upset	38.00
Nov. 5	321 Montcalm E.	Lamp held too close to clothing	25.00
Nov. 11	252 Croghan	Lamp too close to ceiling	33.00
Nov. 15	Mt. Elliott	Lamp too close to clothing	
Dec. 8	178 High E.	Stove upset	2,500.00

List of Casualties Consequent on the Use of Kerosene in Detroit.—CONTINUED.

Date.	Street and Number.	Nature of Casualty.	Amount of Damage.
Dec. 22	59 Jos. Campau	Lamp set fire to clothing	200.00
Dec. 24	441 Hastings	Lamp explosion	400.00
Dec. 24	368 Seventh	Lamp tipped over	
Dec. 25	277 Michigan	Lamp explosion	381.00
Dec. 29	56 Montcalm W.	Lamp tipped over	5.00

*List of Casualties consequent on the use of Kerosene in Michigan (outside the city of Detroit), calendar year 1890.**

Date.	Locality.	Nature of casualty and resultant damage.
Jan. 7	Manistee city	Lamp explosion which caused destruction of a furniture factory, and death of one man, fatally burned.
Mar. 3	Bay City	Fire caused by lamp explosion. Small house burned.
May 18	Flint city	Lamp explosion causing a paper mill to be burned.
Aug. 8	Eagle township	Lamp explosion causing a house to be burned.
Nov. 21	Sturgis village	Fire caused by a woman attempting to build a fire in stove with kerosene. One child fatally, and one man and one woman seriously, burned.
No dates given.	Ossineke township	Fire caused by lamp being upset and broken, on a haymow.
	Franklin township	Fire cause by overturned lamp.
	Grand Ledge village	Fire caused by the explosion of kerosene lamp.
	Grand Haven township	Fire caused by lamp explosion.
	Novi township	Fire caused by tipping over a lantern.
	Vassar village	Fire caused by overturning of lamp by a cat.
	Croswell village	Fire caused by explosion of a lamp.

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* The data on which this list is based were obtained from reports of local health officers, deputy oil inspectors, and newspapers.

The foregoing lists show that of the 55 casualties therein mentioned, 22 were reported to have been caused by lamp explosions, 18 by careless handling of lamps, 6 by stove explosions, 7 by careless use of kerosene in stoves, and 2 by attempts to light fires with kerosene.

A Man Fatally Burned at Manistee City.

The "State Republican" of Jan. 7, 1890, contained the following paragraph:

> "Manistee, Mich., Jan. 7.—The Filer town manufacturing company's furniture works here were completely destroyed by fire yesterday, and one man burned to death.
>
> "The fire was caused by the explosion of a kerosene lamp used by William Chambers, who worked in the finishing department. He was anxious to begin work before daylight and had brought the lamp to the works, where, on attempting to light it, an explosion occurred, and almost instantly the varnish, the man's clothing and the factory were on fire. The unfortunate man was burned to death on the spot, and the other workmen barely escaped with their lives. The building was entirely destroyed, but was well insured."

Fire at Bay City Caused by a Lamp Explosion.

In regard to this casualty, Richard Ferris, Deputy Oil Inspector, wrote March 15, 1890, to Hon. H. D. Platt, State Oil Inspector, as follows:

> "Enclosed find statement made by Lawrence Cramer in regard to his house burning. He says: His child was sick, and got up about 4:30 A. M., and was in an adjoining room; smelt smoke or something to that effect, and when he went to the kitchen found it in flames. Does not know how the fire originated but thought it must have been caused by lamp in some way. Does not think it was on account of the oil. Says he has used same kind for some time prior to fire and is still using it."

The following, relative to this casualty, is from the "Detroit Journal" of March 11, 1890:

> "A lamp exploded in Lawrence Cramer's house, Bay City, yesterday, and the building burned. The loss was small, but it falls heavily upon a poor man."

Lamp Explosion at Flint Alleged Cause of Fire in Paper Mill.

Geo. H. Turner, Deputy Oil Inspector, wrote to Hon. H. D. Platt, May 19, 1890, relative to this casualty, as follows:

> "Yesterday morning, 2 A. M., Hon. F. R. Lewis had the misfortune to have his paper mill burned, or partially so. It was caused by an explosion of a lamp or torch. The night watchman, it seems, after having made his rounds, came in the building quite cold, placed his torch on the wall (brick) burning, and he thought he would warm himself, and in doing so his lamp exploded, and before he could communicate the alarm to the water works, in order to have them sound the fire alarm, the building burned, or nearly so. I made an examination or (test). I found the oil stood 128 degrees.
>
> "It is conjectured that the wick in the lamp was burned down so low it caused gas to accumulate in the lamp which created the explosion."

Fire in Eagle Township Caused by Lamp Explosion.

The "Detroit Evening News" of Aug. 5, 1890, contained the following:

> "Robert Patrick's house, near Portland, was burned to the ground by the explosion of a lamp, and the family barely escaped with their lives. Nothing was saved and considerable cash was lost."

August 12, 1890, E. T. Yeomans, Deputy Oil Inspector, reporting to Hon. H. D. Platt relative to this casualty, wrote:

> "In obedience to your instructions, received Aug. 11, I have today been to the locality of the Patrick fire. The farm is six miles east of Portland, in the township of Eagle, Clinton county.
>
> "Mr. Robert Patrick is the only witness of the origin of the fire. Sunday morning about one o'clock, Aug. 3, Mr. Patrick, feeling unwell arose to take some medicine. The lamp which he lighted had a large glass fount, holding about three pints, and was not much if any more than half full of oil. It had not been refilled during the summer.
>
> "After lighting the lamp, Mr. Patrick left or placed it on a shelf close to a partly open window.
>
> "He then went to a table on the opposite side of the room to prepare and take some medicine.
>
> "The room becoming suddenly dark, he thought the wind had blown out the lamp. He started to get a match from the next room, but had only reached the door when the explosion occurred, throwing fire all over the room behind him.
>
> "Closing the door to the burning room he aroused his family but had scarcely time to get them out before the entire building was in flames. Mr. Patrick thinks that the wind blew the blaze down into the oil chamber. He says no lamp had been used in the house during the summer, only mornings he had used kerosene to light the kitchen fire.
>
> "Mr. P. thinks about five minutes intervened between the lighting of the lamp and the explosion. So long a time had elapsed since the lamp was last filled that no one could tell where the oil was purchased, whether at Eagle (a small station on the D. L. & N. R. R.) or at Portland. It is to be noted that the

lamp was left where it was pretty sure to be at least blown out, instead of on the table where it would seem to have been indispensable for the purpose for which it was lighted.

"The house did not belong to Mr. Patrick; an insurance of $500 on the contents in favor of Mrs. P. is believed to fully cover her interest."

A Child Fatally, and a Man and a Woman Seriously Burned at Sturgis.

The following paragraph appeared in the "Detroit Evening News" of Nov. 21, 1890:

> "Sturgis, Mich., Nov. 21.—Mrs. Charles Maak attempted to build a fire with kerosene last evening. She did not know live coals were in the stove and a blaze was started in the oil in the can. It exploded and she and a 3-year old daughter were fearfully burned. Mr. Maak's body was burned in trying to put out the fire. The child may die from inhaling the flames."

Samuel B. Follett, M. D., health officer of the village of Sturgis, having been written to from this office for information concerning this casualty, wrote Nov. 24, 1890, on this subject, as follows:

> "In regard to the inquiry herewith enclosed, I can say that Mrs. Maak on the evening of Nov. 20, in attempting to start a fire in her cook stove (wood) used kerosene oil. There had been a fire in the stove the fore part of the day and had gone out. She placed kindling in the stove and then in attempting to pour kerosene from the can on the kindling a blaze and explosion followed almost instantaneously. There was but very little kerosene in the can, probably full of gas, at the time of the explosion. The can was torn to pieces from the explosion and the contents thrown upon the hands and arms of Mrs. Maak and upon the head and shoulders of the 3-year old child near Mrs. M. at the time. The child was fatally burned about the head and died on the morning of Nov. 22, about 40 hours after the accident. Mrs. M., seriously burned on the hands, arms and body will probably recover. In attempting the rescue of wife and child, Mr. M. was also seriously burned on the hands and arms."

INJURIES AND LOSS OF LIFE AND PROPERTY ALLEGED TO HAVE BEEN CAUSED FROM THE USE OF GASOLINE IN MICHIGAN IN 1890.

In 1890, as in former years, an effort was made, at the office of the Secretary of the State Board of Health, to collect facts respecting every casualty attributed to the use of gasoline, in Michigan, which came to notice. During the year there were received at the office of the Secretary of the Board reports of 23 casualties in different parts of the State, alleged to have been caused by gasoline, with attendant losses of life and property and personal injury, as follows: Persons fatally burned, 3; persons badly, but *not fatally*, burned, 2; damage to property, $8,395.00.

Of these 23 casualties reported, there occurred in the city of Detroit 20 casualties with loss of property amounting to $3,395.00; in the city of Kalamazoo, 1 casualty with one woman fatally, and another woman seriously burned; in the city of Owosso, 1 casualty, with one man fatally burned, and an estimated damage to property of $5,000.00; at Weston, Lenawee county, one woman fatally, and one man badly burned.

The following list of casualties in Detroit, and extracts from communications received from correspondents, together with clippings from newspapers, give what details we have in regard to the above-mentioned casualties:

List of Casualties Consequent on the Use of Gasoline in Detroit. Calendar year, 1890. (Supplied by William H. Baxter, Fire Marshal in Detroit.)

Date.	Street and No.	Nature of casualty.	Amount of damage.
January 12	812 Twelfth	Leaking stove	
January 29	1110 Vinewood	Man carried a pail of gasoline near a light	$150.00
January 30	58 Cadillac Square	Overflowing stove	137.00
March 27	240-242 Gratiot	Torch explosion	1,300.00
April 26	426 Congress	Careless handling of vessel containing gasoline	
May 29	315½ Michigan	Stove overflowed	
June 14	152 Theodore	Stove explosion	1,006.00
June 21	233 Second	Overflowing stove	$78.00
June 27	75 Joy	Overflowing stove	
June 30	197 Porter	Overflowing stove	
July 1	39 Milwaukee E.	Overflowing stove	
July 2	815 Michigan	Overflowing stove	
July 7	50 Perry	Overflowing stove	80.00
July 18	161 St. Antoine	Overflowing stove	
July 13	83 Columbia W.	Overflowing stove	
September 12	318 Congress E.	Overflowing stove	
September 17	67 Foundry	Overflowing stove	
September 19	771 Woodward	Stove explosion	
November 12	1005 Vinewood	Overflowing stove	$50.00
November 13	60 Spruce	Overflowing stove	

Fatal Burning in Kalamazoo.

The Detroit Tribune of Nov. 18, 1890, contained the following paragraph:

> "Kalamazoo, Nov. 17.—Two weeks ago Mrs. Briggs and Miss Nettie Wildsmith were burned by an explosion of gasoline. The former recovered, but the latter suffered excruciatingly and this morning died. She was 20 years old."

A letter was sent from this office to Dr. A. B. Cornell, health officer of the city of Kalamazoo, asking details in regard to this casualty. His reply was as follows:

> "Your favor in regard to death of Miss Wildsmith is at hand. I have made a thorough examination of the case and find as follows: Mrs. Briggs purchased of the hardware firm of C. H. Dickinson a quantity of stove blacking, composed of *resin, plumbago, black varnish*, and *gasoline*. I am told that the firm use this to black their stoves. They prepare it themselves. The way the accident occurred was this. Miss Wildsmith was preparing the blacking in a jar on the hearth of the stove, in which there was a fire, and was stirring the gasoline into the mixture with a poker when the gasoline exploded, burning her to death. It was like all similar cases a piece of carelessness, though I think the sale of such stuff should be prevented by law. Though there might not have been any harm done in careful hands, or in the hands of the dealer. There is also another kind sold by all dealers that has turpentine and oil in it, * * * which I am of opinion is dangerous to public health, through just such carelessness as the above."

A Man Fatally Burned at Owosso.

The Detroit Evening News, of Nov. 29, 1890, contained the following:

"Owosso, Mich., Nov. 29.—John A. Chapman was boiled to a jelly in a gasoline tank at the gas works last night. He was a new man, and went near the vat with a lighted lantern. A terrific explosion followed, and the unfortunate Chapman fell into the burning, boiling oil and remained there until this morning.

"The explosion happened about 6 o'clock and shook the whole city. A flame shot 100 feet into the air. Soon a second report was heard and fire burst from an adjacent tank. The two blazed furiously, brilliantly lighting the town and country round about. * * *

"The loss to the company will be about $5,000, and Owosso will be in total darkness until the plant is repaired, as the electric light works will not commence running until next week."

In response to a letter of inquiry in regard to this casualty, sent from this office, to Dr. S. S. C. Phippen, health officer of Owosso, the following letter, dated Dec. 7, 1890, was received:

"Your letter received and in answer I would say that I have enclosed a clipping from the 'Shiawassee American,' printed here, and which gives a very good description of the explosion. It is a better one than I could get up myself, although I hardly think the theory advanced as to the cause of it is correct, still it may be. The cause of it is not known and never can be found out."

Extracts from the clipping from the "Shiawassee American," referred to by Dr. Phippen, are as follows:

"Last Friday evening, about 6:30, the entire city was startled by a terrific explosion in the direction of the gas works, just south of the D. & M. depot, and instantly a flame shot up heavenward to a height of nearly seventy-five feet, indicating that the explosion was at the gas works. The effect of the explosion was felt throughout the city and for a long distance outside.

"The fire department responded with great promptness, and arriving at the scene found that the two large tanks west of the works were in flames, and at once commenced operations to save the building and works from destruction. Two streams were sufficient for the purpose, which were kept up until the oil had burned out, and the works were saved with but little damage to the building, and no stop in the supply of gas. Mr. O. F. Webster, superintendent of the works, says the department deserves much credit for thus saving the company's property.

"It was the storage tanks for naphtha that exploded. These tanks were about forty feet west of the gas works, lying parallel extending east and west, and were in a hole dug in the ground for the purpose, the one on the north side projecting about two feet above the ground and the other but a few inches. The tanks were of 3-16th shell with half inch heads, made by Reeves & Co., of Toledo, Ohio. They were 30 feet long and eight feet in diameter, and held over 11,000 gallons each. The tank on the south side contained at the time between 2,000 and 3,000 gallons of 63 naphtha, and the other had at the time about 6,000 gallons. The latter was a new tank and was filled that day for the first time. There was no cover over the tanks at the time. Mr. Webster says the new tank was absolutely air tight, as before it was filled it would float on the water that was in the hole. The new tank, containing the largest amount of naphtha, was exploded first. The manhole to this tank was in the center of the tank, and a few inches west of it was a hole just large enough to admit a two-inch pipe to connect with the transportation tank on the car standing on the south side of the tanks.

"Jonas A. Chapman, the engineer, and Charles Sprout were in charge of the works at the time. * * *

"The men commenced emptying the car into the tank about 3 o'clock in the afternoon of that day, and about two hours time was required for the naphtha to run through into the tank, and, darkness coming on, Chapman and Sprout decided to leave it until morning before uncoupling the hose connecting the car and tank, to avoid going near it with a light.

"Chapman's house is a few rods directly west of the tanks and a beaten path ran along the north side of and close to the tanks from the house to the works, and Chapman's son, aged about 18 years, went to call his father to supper, carrying a lantern, and in passing the tanks found a board sticking out of the hole somewhat obstructing the path, and he stopped and pushed it down into the hole beside the tank, so his father would not run against it. He says he was there at least two minutes with his lantern, and after calling his father passed back to the house. His father told him he would go to the house in a few minutes to get his supper and get ready to go to Corunna to attend lodge. The boy had been in the house but

> a few minutes when the explosion occurred. Mr. Nichols, living near, says Chapman came out of the works with a lantern in his left hand, and locked the door, and he called to him to go with him to the Odd Fellows' lodge that evening and walked over to near Chapman, but the latter said he was going to Corunna and asked Nichols to go with him, but N. said he could not go. Chapman was then near the corner of the building, and said he must hurry to get ready to go, and Nichols started for his home and had gone only about ten rods when the explosion occurred.
>
> "Chapman's lantern was found, considerably bruised and the globe and bail broken out, about 25 feet southwest of the tanks and his cap lying between the lantern and tanks. After the oil had burned out his body was found about 11 p. m. in the pit on the north side of the tank within about two feet of the west end, his head toward the west. Mr. Sprout found the body, and assisted by the firemen, took it out. and Coroner Baldwin held an inquest. The left side of his face was burned and the hair slightly burned from the left side of his head, and his mustache was all burned off except a little on the right side. Otherwise the body was not burned or boiled, as erroneously stated in dispatches sent out, the water in the pit and which ran in from the streams thrown by the fire department preventing the body from being entirely burned up. * * *
>
> "Mr. Webster's theory of the accident is that Chapman, who had complained during the day of a severe headache, on going to his house accidentally stepped or slipped into the hole beside the tank, and in falling naturally threw up his hands, and having the lantern in his left hand it struck the tank very hard, breaking the globe, and the light coming in contact with some naphtha that may have been on the tank, slopped over from filling, ignited it, and instantly penetrated the tank. The tank on the south side exploded soon after. The concussion of course killed Chapman instantly.

A Woman Fatally Burned at Weston.

The following paragraph appeared in the Detroit "Evening Journal" of Nov. 26, 1890:

> "Weston, Mich., Nov. 26.—Maria Mead, a widow living over H. P. Tolford's store, set her clothing on fire last evening, while lighting a gasoline stove, and died a few hours after. She leaves two young sons. Mr. Tolford was badly burned in his efforts to rescue Mrs. Mead."

Dr. F. W. Essig, health officer of Fairfield township, Lenawee county, where Weston is situated, was written to from this office for further particulars relative to this casualty. His reply, dated Dec. 10, 1890, was as follows:

> "I will state that I was called in great haste on the eve of Nov. 26 (I think) about 6 o'clock, to attend Mrs. Mead. I learned the following: It seems she filled the cup of the generator to her gasoline stove to overflowing. She then lit it and took a cloth to wipe up what had run over. The fire dropping on the cloth set it afire. She then tried to put it out with her apron, which in turn caught fire. She then became frightened and ran down stairs, and seeing the door to Mr. H. B. Tolford's store open started to go in, but was stopped. Mr. Stolford then ran up stairs and got a blanket and wrapped her in it. Before he got down, however, some one had torn her clothes partly off. It was at this time that I was called. I ordered her taken to her brother's, one Judson Schomp, where she died four hours later. About two-thirds of the entire surface of her body was burned, the worse being her hands, abdomen, inner surface of her thighs, hypochondriac and epigastric regions."

Fatal Burning of a Woman in Bruce Township. Not Caused by Gasoline.

The Detroit Tribune of April 22, 1890, had the following paragraph:

> "Romeo, April 21.—Twenty-year old Mrs. Schoultz tried to light a fire by using gasoline this morning and will die probably as a result. There was an immediate explosion and the flames set fire to Mrs. Schoultz's clothing. She screamed for help, but was horribly burned before the fire was put out by friends, who rushed to her rescue."

It appears from the following letter from Dr. John B. Fares, health officer of the village of Romeo, Macomb county, who was written to for particulars relative to this casualty, that it was not attributable to the use of gasoline. Dr. Fares wrote to this office April 23, 1890, as follows:

> "The particulars in regard to the accidental burning of Mrs. Etta May Sharfe, a lady 21 years of age, are as follows: She was serving as a domestic in the family of Orlando N. Devereaux, who lives in the township of Bruce, just outside the village limits. She had nearly completed the washing and was drawing water from the washing machine and emptying it with a pail. The stove had a low hearth, and it is supposed the skirt of her dress caught fire by actual contact with the wood fire which had been lighted in the early morning, but with ordinary wood kindling, no gasoline ever having been used in the house. She ran some fifty or sixty rods, seeming bewildered; in short, her clothing all burned from her body, and she died in twelve hours. Dr. Greenshields was called to the case.
>
> "This occurred on Monday, the 21st inst."

CASUALTIES CONSEQUENT ON THE USE OF NAPHTHA IN MICHIGAN, CALENDAR YEAR 1890.

During the year 1890, there were reported to the office of the Secretary of the State Board of Health four casualties in the State, caused by the use of naphtha, with consequent damage to property amounting to $50.00. Three of the above-mentioned casualties occurred in the city of Detroit, as shown in the following list, and one in the city of Owosso. Of this latter casualty we have no detail other than the fact that a fire was caused by an explosion of naphtha.

List of Casualties Consequent on the use of Naphtha, in Detroit, Calendar year 1890.
(Supplied by William H. Baxter, Fire Marshal in Detroit.)

Date.	Street and No.	Nature of casualty.	Amount of damage.
Feb. 21	215 Gratiot	Using stove blacking while fire was burning	
May 20	160 Fourth	Vapor ignited	
June 16	Wight	Gas at varnish works took fire	$50 00

ALLEGED NUISANCES IN MICHIGAN IN 1890.

During the year 1890, communications relative to alleged nuisances, were received at the office of the State Board of Health, from thirty-one localities in Michigan.

The causes to which the alleged nuisances mentioned in these communications were attributed, may be classified as follows:

Sewers, 1; pollution of wells, streams and water supplies, 5; swamps and marshes, 1; sink holes, 1; slaughter-houses, 4; trying out meat scraps in the open air, 1; lowering of the water in Carp river, 1; lowering of the water in Carp lake, 1: water diverted from its natural course floods cellar, 1; is landlord or tenant required by law to empty privy, 1; how to prevent the repetition of a nuisance once abated, 1; surroundings and refuse from a creamery, 1: cider mills, 2; privy vaults, 1; slops, 1; abatement of nuisances in general, 1; commercial fertilizers, 1; hogs and manure piles near residences, 2; cemeteries, 1; unhealthful school-houses, 1: noxious weeds, 1; meat of an animal killed in railroad collision, 1.

The following extracts from the correspondence of this office relative to the above-mentioned alleged nuisances, show the nature of those nuisances, and the action taken, and recommended to be taken, in regard to them.

SEWERS EMPTYING INTO A CREEK.

S. W. Merritt, M. D., health officer of Fort Gratiot, St. Clair county, wrote to the Secretary of this Board Jan. 4, 1890, as follows:

> "Has the board of health power or authority to stop any person or persons from running sewers into the mill creek? In this creek the water is low and stagnant about one-third of the year, the remainder of the year it will clear itself by carrying off all refuse that might accumulate. There has been a request laid before me as health officer, to take immediate steps to abate this nuisance. Now I am not prepared to say what authority I have as health officer to prevent these parties from running their sewer into the creek, and I am of the opinion it would be hard to prove it to be a nuisance.
>
> "Any information you might suggest would be thankfully received by me in this case. The location of the creek is so formed by nature that it is a hard thing to remedy. Another question—Is it violating the sanitary law of this State to turn a sewer into a small creek?"

In reply to the above letter, the Secretary wrote to Dr. Merritt January 7, 1890:

> "In reply to your letter of Jan. 4, concerning an alleged nuisance, I enclose herewith two pamphlets, in which I have marked paragraphs bearing on the points you mention. The emptying of a sewer into a creek might, under certain circumstances become a nuisance; but if, in the present instance, there is any doubt about the alleged nuisance being a nuisance in fact, the safer course would be to enter a complaint before the circuit court (or the circuit judge sitting in chambers) and secure an injunction to stay or prevent the nuisance. The *local board of health* is required by law to examine into all nuisances and prevent or abate them as the case may require; and when there is doubt about the alleged nuisance being a nuisance in fact, the *local board of health* should make the complaint before the circuit court. However, if the *local board of health* neglects or refuses to make the complaint anyone injured may do so. The health officer is not required by law to act except as an executive officer of the local board."

WELL SPOILED BY USING AN ADJOINING WELL AS A PRIVY.

Jan. 22, 1890, Mrs. O. E. Mann, of Big Rapids, addressed the following letter to this Board:

"I live on the west bank of Muskegon river, perhaps one hundred and fifty feet from the river. Four years ago I had a well dug. * * * I was at considerable expense to have it graded and sodded around it. About 100 feet further west lives one Mary Shier, who has a well on a direct line and depth of mine. In December the neighbors using water from my well, and my own family, complained that the water was not as good as formerly. Then I discovered that for the last three months this Mary Shier had been using her well for a privy. The men who did the work for her tell me it was not filled up at all, and that they told her at the time it would ruin my well. Therefore, thinking it would be useless for me to speak to her about it, I told the mayor, who lives across the street from me. He took it before the council, who constitute the board of health, and they claim there is no remedy. Consequently, I write to ask you if I must lose my well and have no redress."

In reply to the above letter, the Secretary of this Board wrote to Mrs. Mann, Jan. 23, 1890:

"In reply to your letter of Jan. 22, in regard to an alleged nuisance, I would say that Wood in his 'Law of Nuisances' states on page 119:

"So if a person erects a vault or cess-pool upon his own premises, he is bound at his peril to keep in the filth; for if it escapes, either by percolating through the earth or otherwise, upon the premises of another, he is answerable for all the damages that ensue therefrom."

"Again, on page 556, he states:

'Privies are regarded as *prima facie* nuisances. * * * * if they are built or allowed to remain in such a condition as to annoy others in the proper enjoyment of their property, by reason either of the noisome smells that arise therefrom, or by the escape of filthy matter therefrom upon the premises of another, or so as to corrupt the water of a well or spring, they are nuisances, in fact, and render the person erecting or using them liable for all the injurious consequences flowing therefrom.'

"I enclose herewith two pamphlets in which I have marked paragraphs of interest to you in this connection.

"The 46th Michigan Report.* p. 548, states that 'It has been decided in several cases that the percolation of filthy matter from premises of the party who suffers it through the soil upon the premises of an adjacent owner to the injury of the latter, is an actionable nuisance.' and several cases and decisions are there referred to."

May 7, 1890, Mrs. Mann again wrote to the Secretary as follows:

"Your letter, * * * * and marked paragraphs were read before the council and the matter was turned over to the city attorney. I send you at this date a paper containing his decision. There has been nothing done about it since. Several have spoken to me about taking the matter into court."

Following is copy of the city attorney's opinion, referred to by Mrs. Mann, taken from "The Evening Bulletin" of Feb. 18, 1890:

"The recorder read a communication from the city attorney, to whom was referred at the last meeting the complaint of Mrs. O. E. Mann, of a nuisance on the premises of Miss Shier. The city attorney stated that the city had no ordinance in force that meets the exigencies of the case in question, and that instances are rare where the officers of a city have a right to interfere in such a matter. He was of the opinion that the city had not the power to abate the nuisance complained of. In his opinion the only recourse for Mrs. Mann would be to bring the matter into court by an action for damages, and the question of the polluted well being a fact would have to be proven by a chemical test or analysis of the water. On motion, the report was adopted and ordered placed on file."

May 9, 1890, the Secretary again wrote to Mrs. Mann:

"Your letter of May 7, is before me, as is also the Evening Bulletin of Feb. 18, 1890. * * * The marked pamphlet points out that it is the duty of the local board of health to abate all such nuisances, and I will today write to the president of the local board of health respectfully asking his attention to the law.

"I should be glad to be informed of the final outcome of the business."

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* Decisions of Supreme Court.

May 9, 1890, the Secretary wrote to the Mayor of the city of Big Rapids:

"Complaint reaches this office of a nuisance on the premises of one Mary Shier in Big Rapids. The nuisance being one of the most unmistakable kind possible, being no less than the use of a well for the purpose of a privy vault. The well being only about 100 feet from a neighbor's well, and such a privy-well being liable to endanger the water-supply for a great distance throughout that part of the town.

"There may be no section of law which specially mentions such an outrageous nuisance as this; but it must be apparent to any thinking person that if there is any nuisance which a local board of health should deal with, it is such an one as this, and § 1640, Howell's Statutes, requires every board of health to examine into all nuisances and 'destroy, remove or prevent the same, as the case may require.'

"I trust your board of health will promptly 'examine into' this alleged nuisance and if found as I have stated it, or if found to be a nuisance, that it will be promptly abated.

"There is a law, Act 136, 1881, which empowers boards of health in townships and villages to declare any privy or water-closet a nuisance and order and enforce the abatement thereof. Undoubtedly city boards of health would have been included in this law, except it is considered that every city has the power to make such an ordinance.

"It will give me pleasure if you will kindly inform me what action is finally taken by your board of health.

"I am aware that this subject has been before the common council in your city; but I think the duty of the local board of health must have been overlooked, possibly because of my letter to Mrs. O. E. Mann, which pointed out methods whereby she could act for damages. But this should not excuse the board of health from action which is required by § 1640, Howell's Statutes. Section 1640 is a part of Chapter 46 of the compiled Laws of 1871, and § 1681, Howell's Statutes, makes 'the provisions of this chapter and the amendments thereto to apply to *cities* and villages in this State * * * excepting in cases where the charters of such cities and villages contain provisions inconsistent herewith.' I do not suppose there is anything in the charter of Big Rapids 'inconsistent' with the abatement of such an outrageous nuisance, as the one alleged to be on the premises of Mrs. Mary Shier."

In reply to the foregoing letter, the following was received at this office:

Recorder's office, Big Rapids, Mich., May 28, 1890.

HENRY B. BAKER, *Secretary of Michigan State Board of Health, Lansing, Mich:*

DEAR SIR—Referring to your communication of the 9th inst., relative to alleged nuisance of well used as a privy vault on the premises of Mary J. Shier, in this city. The same was received and submitted to the common council of this city at their regular meeting held May 19th inst., and by said council laid on the table, and recorder instructed to notify the State Board of Health of this action.

Respectfully,

S. G. WEBSTER, *Recorder.*

May 23, 1890, the following was received from Mrs. O. E. Mann:

"I send you at this date the paper containing the last decision of the board of health in regard to the well. No person or committee has ever been here to see or enquire about the well. I never had any conversation with any of the council except Ald. Kierstead. I gave him the documents you sent Jan. 23, and asked him to take them before the council, the Mayor being out of town at that time. And now Ald. Thrall, without making any enquiry, says it is a quarrel between two neighbors. I think that is adding insult to injury. * * * * It is no longer a personal matter with myself. There are within a radius of two or three hundred feet seven wells besides my own, that people are using, and I am informed that some of the owners are very much interested in the matter. C. H. Wagner (druggist) owns one of the wells, which cost him one hundred dollars, aside from the platform and pump. He consulted the man that dug his well, and that man said it was only a question of time before his well was ruined also. I hope you can and will make it clear to our board of health their duty."

May 24, 1890, the following reply was sent to Mrs. Mann, by the Secretary of this Board:

"Please accept thanks for copy of the Bulletin, also for your letter.

"The State Board of Health has no power to enforce the abatement of a nuisance. This rests with the local board of health.* However, if the local board neglects or refuses to take proper action, you yourself or any person injured or annoyed by the nuisance can make complaint before the circuit court or the

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[* The words "or with the courts," should have been added here.]

circuit judge sitting in chambers and secure an injunction, as pointed out in the paragraphs which I have marked in a pamphlet enclosed herewith."

ALLEGED CONTAMINATION OF THE WATER OF LITTLE CLAM LAKE.

February 18, 1890, M. C. Heath, M. D., health officer of the city of Cadillac, wrote to the Secretary of this Board as follows:

"A man while crossing Big Clam Lake on the ice with team and wagon load of supplies, broke through the ice, his team, supplies and all going to the bottom. Said supplies consisting of barrel of beef, barrel of pork, one dressed hog, one quarter of beef, hay, flour, etc. The water is about 30 feet deep. This part of the lake is in Selma township. The city of Cadillac gets its water supply from the lake, that is, Little Clam Lake. * * * Who can I compel to remove them? They are not in city limit; but contaminate our water supply. Please advise me and oblige."

In reply to Dr. Heath's letter, the Secretary wrote to him, Feb. 19, 1890:

"I would say that I do not know of anyone who could be *compelled* by law to take the beef, etc., of which you speak, out of the lake. I think that if the city of Cadillac undertook to do it, no one would probably interfere. It is possible, however, that the owner might care enough for the supplies to pay for raising (?)."

SWAMP ALLEGED TO BE A NUISANCE IN ST. IGNACE.

April 10, 1890, John Hile, a resident of St. Ignace, wrote to this office, stating that surface water, to the depth of two feet, coming from a swamp in his vicinity, had settled near his residence, was causing sickness in his family, and asked that measures be taken by this Board to cause the abatement of the nuisance.

In reply to Mr. Hile's request, the Secretary wrote advising him of the proper mode of procedure to have the nuisance abated.

SINK HOLES DUG BY RAILROAD COMPANY ALLEGED TO BE A NUISANCE.

April 12, 1890, James W. Goodfellow, health officer of Venice township, wrote to the Secretary of this Board as follows:

"When the railroad company built the road from Durand to Saginaw, at the little village of Lenon, in the township of Venice, they dug and left some sink holes which fill with water, and the water has to dry away, for there is no outlet. Now can the company be made to take the water away or must it be done at the expense of the township? The water holes are quite near some dwellings, so we deem it necessary that the water should be taken away; and if by the railroad company, to whom should we make complaint or demands? I am of the belief that the company will not pay any attention to us without we establish the fact of nuisance. Now we would be very glad to be instructed in regard to this matter."

In reply to Mr. Goodfellow's letter, the Secretary wrote to him April 14, 1890:

"I send you herewith two pamphlets in which I have marked paragraphs from which you will see that in all matters relative to nuisances, where there is not a plain, adequate and complete remedy at law, the better course is to enter complaint before the circuit court or the circuit judge sitting in chambers, and secure a judicial order for the abatement of the nuisance. I should think that this was such a case. In matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the circuit court or the circuit judge sitting in chambers has equity jurisdiction. The local board of health should make this complaint; but in case the local board neglects to do so, any one injured thereby may make the complaint.

SLAUGHTER HOUSES DEEMED NUISANCES.

Mr. Van Slyke wrote to this office April 16, 1890, from Gaylord, Otsego county:

"We have a pretended health officer. He don't attend to business. He allows dead animals to be left without being buried or covered in any way in the corporation limits; and the villagers have allowed them to put up a slaughter house within sixty rods of where people live. Several people have threatened to write to the State Board of Health.' My place is within or lines up to corporation limits. I think it causes contagious diseases. I lost a son last fall with typhoid fever. We had to work near the slaughter house. It made him so he vomited at that time; and a short time after that he was taken sick with typhoid fever and died; and I think it is about time to have something done. Please attend to it. Dr. H. Wills Warner is the health officer's name."

In response to Mr. Van Slyke's letter, the Secretary wrote to him April 17, 1890:

"I send you herewith two pamphlets in which I have marked paragraphs from which you will see that the law prohibits the maintaining of a slaughter house within twenty rods of any public highway. You will also notice, that the law gives the village council authority to assign places for the exercise of trades offensive to the inhabitants, and that if such place becomes a nuisance, and shall be made to appear such before the court of the county, the court may revoke the assignment. In all matters pertaining to nuisances where *there is not a plain, adequate and complete remedy at law*, the circuit court (or the circuit judge sitting in chambers) has equity jurisdiction (§ 7965, Howell's). The complaint should be made by the local board of health, but if the local board neglects to do this, any one injured by the nuisance may make the complaint. No name of health officer has been returned to this office for the following year. If Dr. H. Wills Warner is not to be the health officer for the next year, it might be well to wait until one is appointed. I enclose a blank for the return of the name of health officer."

May 19, 1890, Mr. John Kinney, supervisor of Walker township, Kent county, wrote to the Secretary of this Board as follows:

"I would like some instructions from the State Board of Health in regard to slaughter houses and rendering works which are located in this township. There are two rendering works located right beside the highway. Now I would like to know how to proceed to compel their removal. They are not kept in a very good shape. The stench is bad. The board is undecided what to do and how to commence proceedings. Hoping to hear from you soon, I remain yours respectfully."

Replying to Mr. Kinney, the Secretary wrote May 20:

"I send you herewith two pamphlets in which I have marked paragraphs from which you will see that the law expressly prohibits the maintaining of a slaughter house within twenty rods of any public highway in any township. You will also see that the local board of health is required by law to enquire into all nuisances and to prevent or remove them as the case may require. In any case where there is any doubt about an alleged nuisance being a nuisance in fact, it is better for the local board to enter complaint before the circuit court or the circuit judge sitting in chambers and secure a judicial order for the abatement of the nuisance. In all matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the circuit court for the county has equity jurisdiction."

June 15, 1890, Mr. August Vedstiad wrote to the Secretary of this Board from Grand Rapids:

"I would like to ask your advice on a question which I will lay before you. One year ago last February I moved to Grand Rapids from Hillsdale city, expecting to be absent a couple of years. The spring following my removal, Mr. Robert Croose, a butcher by trade and running a meat market at Hillsdale, erected a slaughter house within six rods of my house and inside of city limits; and last July when I went out to Hillsdale to do my harvesting, I found said slaughter house there and it made us all sick. While there had to go to Dr. Harris for remedies for my wife and child; also laid a petition before common council for removal of said house, and they paid no attention to it. Called Dr. Sawyer to investigate the place and he said it was not allowed there under the laws of the State. Have plenty of witnesses to prove it was a nuisance. J. K. Fisher of First State Bank; and men to prove that they had to quit work on the building it was so bad; and also Merrit Walworth, a farmer that cut my wheat, was made sick from the smell. I also went to the city attorney and asked him to see to the removal of it. But because I was a poor man they think they can do as they have a mind to. I expect to go back there and I can't live there with that under my nose and be made sick and my family as well. I am trying to pay for my ten acres and I can't afford to lose my home for the sake of some one's slaughter house. I don't think it has any business inside the city limits. It is so close you can hear cattle fall when they are knocked in the head. Can hear the blow as well. Mr. Shaddock told me to lay the case before you as the rest paid no attention to it; and I want to know what can be done; and I would like an answer by Wednesday as I go to Hillsdale Thursday or Friday to cut my hay and perhaps to live if that can be removed so I can live on my place."

In reply to Mr. Vedstiad's letter, the Secretary of this Board wrote to him June 16, 1890:

"I send you herewith two pamphlets in which I have marked paragraphs from which you will see that the law in this State prohibits the maintaining of a slaughter house within twenty rods of any public highway, and the local board of health is required by law to examine into all nuisances and remove or prevent them as the case may require. The mayor and aldermen of every city are authorized to assign places for the exercise of dangerous or offensive employments and to forbid their being carried on in any other places.

"If, however, the local board of health refuses or neglects to abate the nuisance, any one injured thereby may make complaint before the circuit court or the circuit judge sitting in chambers and secure a judicial order for the abatement of the nuisance. The circuit court for every county has equity jurisdiction to grant injunctions abating nuisances, where there is not a plain, adequate and complete remedy at law."

July 3, 1890, Mr. Charles Lahser, a resident of Sand Hill, Redford township, Wayne county, wrote to the Secretary of this Board as follows:

"There exists a nuisance in my vicinity * * * * in a slaughter house which is nearly surrounded by residences at no great distance from said building; and during this sultry weather it is almost impossible to keep doors open at night if the wind be in the right direction; and nearly all the neighbors have complained of said stench to the township health board; but they came and left some directions to improve its condition; but the stench is as bad as ever, and I write to you to find out what we can do to abate said nuisance, if there be any way to do so, as we are afraid it will cause sickness."

In reply to Mr. Lahser, the Secretary wrote to him July 5, 1890, explaining the legal steps necessary to insure the abatement of the alleged nuisance.

RENDERING OF MEAT SCRAPS AN ALLEGED NUISANCE.

C. E. Rice, a resident of Richmond, Macomb county, wrote to the Secretary of this Board, April 25, 1890, as follows:

"Is there any law against trying out meat scraps for lard, tallow, etc., in the open air within a stone's throw of the main street of a village? We have one butcher (J. F. Boucher) here who persistently tries scraps, guts, etc., just behind his store, in fact he does any work of a butcher's shop except killing the stock."

Replying to Mr. Rice, the Secretary wrote to him, April 28, 1890:

"I send you two pamphlets in which I have marked paragraphs, from which you will see that the courts are very careful to protect the rights of people to air uncontaminated by noxious odors, etc. You will also see from these pamphlets that the work of abating nuisances rests with the local board of health. The local board is required by law to examine into them and abate them. If the orders of the local board of health are not obeyed, and there is any doubt about the alleged nuisance being a nuisance in fact, the safer course is to appeal to the Circuit Court (or the Circuit Judge sitting in chambers) and secure a judicial order for the abatement of the nuisance. In all matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the circuit court has equity jurisdiction.

"The law prohibits the rendering of any dead animals, as a business, within twenty rods of any public highway, and gives the council of the village, etc., discretionary power to assign places for the exercise of such trades."

LOWERING THE WATER IN CARP RIVER AN ALLEGED NUISANCE.

Wm. P. Kearns, Prosecuting Attorney of Leelanaw county, wrote to the Secretary of this Board, April 21, 1890:

"I have been instructed by our county board of Supervisors, to write to you for some advice regarding the health of the people of Leelanaw Co. The Iron Star Furnace Co. received permission in 1859, to build a dam across Carp river. Through spite work this spring, they have raised all the flood gates and cut holes in the dam in order to let the water down. Now if this water is let down, a great deal of land that has been overflown for years will become dry, and this is sure to cause great sickness and deaths. We have had experience in this matter before. Some years ago they let the water down in the same way, and the people who inhabited parts of the country along the lake had to leave. They could not stand the stench of the decaying of this vegetable matter in the hot season of summer. It also caused an epidemic.

"Now, what we want to know is, can we not, through the State Board of Health, enjoin them from letting the water down until fall at least?

"Any information that you can give us on this subject will be gratefully received."

In response to Mr. Kearn's letter, the Secretary wrote to him April 23, 1890:

"I enclose two pamphlets giving references to laws bearing on the subject of nuisances, etc. As you will see, from paragraphs which I mark, this is plainly a case where it will be necessary to make complaint before the circuit court or the circuit judge sitting in chambers, who, under § 7965, Howell's Statutes, has equity jurisdiction in such cases, and secure an injunction. I think there is no doubt whatever but that, generally, lowering the water in the way you mention is a great source of sickness, and it is only necessary to set the facts before the judge so that he should see it in that light. A case exactly similar occurred in this city some years ago, and the court granted the injunction, restraining from lowering the water during the warm season of the year."

In regard to this alleged nuisance, Dr. H. A. Sifton, health officer of Sutton's Bay, wrote, May 31, as follows:

"Through some illwill the Leland Iron Co., who control the outlet of Carp Lake, have lowered their dam and caused the lake to fall some two feet, thereby uncovering hundreds of acres of marsh and cedar swamp land which has been under water for many years, since the dam was built in 1865-6. The lowering of the water for a few days last summer (8 to 10 inches) caused two or perhaps three cases of typho-malaria (so called) last fall, which I reported to you.

"Is there anything to do about the matter?"

In reply to Dr. Sifton, the Secretary wrote giving him all necessary information, and sending him pamphlets containing the laws bearing on the subject of nuisances and how to abate them.

WATER DIVERTED FROM ITS NATURAL COURSE ALLEGED TO BE A NUISANCE.

Dr. John F. Berringer, health officer of Watervliet township, Berrien county, wrote to the Secretary of this Board, May 26, 1890, in regard to an alleged nuisance in his jurisdiction, as follows:

"We have a case in this jurisdiction where, through the course pursued by a former highway commissioner, water has been diverted from its natural course and permitted to flood the premises of an individual. Water over two feet deep in cellar, thereby endangering the health of occupants. I have been appealed to. What powers and authority have I in the premises? Can I accelerate the slow process of proper officials who require thirty to sixty days time to abate the nuisance? An early reply is earnestly solicited."

In reply to Dr. Berringer's letter, the Secretary wrote, May 27, 1890, as follows:

"I send you herewith two pamphlets in which I have marked paragraphs from which you will see that the local *board of health* is required by law to examine into all nuisances, and prevent or abate them as the case may require. However, if there is any doubt about the alleged nuisance being a nuisance in fact, the safer course is to appeal to the circuit court or the circuit judge sitting in chambers, and secure an injunction abating the nuisance. In all matters pertaining to nuisances where there is not a 'plain, adequate and complete remedy at law' the circuit court for the county has equity jurisdiction. While the *local* board of health should make the complaint, any one injured or annoyed by the nuisance may do so. I suppose, from what you write, that your board should apply to the circuit judge for an order to the *present* highway commissioner to act promptly in order to stay the alleged nuisance."

WHETHER LANDLORD OR TENANT IS REQUIRED BY LAW TO EMPTY THE PRIVIES, ON RENTED PREMISES?

E. A. Wallin, a resident of Davison, Genesee county, wrote to the Secretary of this Board, June 6, 1890, asking whether the law required that the landlord of rented premises should empty the privies pertaining thereto, or whether that duty legally devolved on the tenant occupying such premises.

In reply to Mr. Wallin's question, the Secretary wrote June 6, 1890:

"I know of no law specifying whether the landlord or the tenant shall be required to cleanse a privy.* I think the law gives the board of health the power to require it of *either* the landlord or the tenant, as *it* may determine.

"Herewith I send you a pamphlet in which I have marked the paragraphs referring to the laws.

"By this mail I send you an old compilation of the laws, in which I have marked the paragraphs bearing upon this subject.

"If this office can be of any further service to you it will give me pleasure."

HAS A HOUSEHOLDER A RIGHT TO REVIVE A NUISANCE ONCE ABATED?

W. Flagler, M. D., health officer of Imlay township, Lapeer county, wrote to the Secretary of this Board, June 16, 1890, as follows:

"After a nuisance has been abated as ordered by local Board of Health, has the householder a right to put causes in operation to repeat the same nuisance? What course should the Board pursue under the circumstances?"

In reply to Dr. Flagler's letter the Secretary wrote, June 17, 1890:

"I send you herewith two pamphlets from which you will see that the local board of health may order the owner to abate a nuisance within twenty-four hours, and, if he refuses, may abate the nuisance at once at his expense.

"More than this,—the local board may make regulations declaring a certain condition of things a nuisance and enforce such regulations, providing they are published in some newspaper in the county or posted in five public places.

"The *health officer* has not power to abate a nuisance except as executive officer of his board by *its* order."

REFUSE FROM A CREAMERY ALLEGED TO BE A NUISANCE.

The following letter, dated June 21, 1890, was received by the Secretary of this Board, from Edwin Eaton, M. D., health officer of Hudson, Lenawee county:

"A short time ago, complaint was made to me, that a creamery situated upon the main business street in close proximity to a large number of residences was an intolerable nuisance, and upon investigation, I found the same to be a fact, and so reported to the village council. That body sent a committee to examine it and they sustained my report. A petition signed by about one hundred residents of the neighborhood was presented, asking that the nuisance be abated, was received and laid upon the table; and the proprietors of the creamery ordered to clean up. But in my opinion the nuisance is unabated, and I believe impossible for a creamery to be run where this is located, without endangering the health of many people. Two families at least have been obliged to vacate their residence property, at a great financial loss; and to avoid sickness which is very likely to occur during the hot summer months, from the decaying buttermilk, which is allowed to run out and decay.

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* "I think the *custom* in this city is for the tenant to attend to this subject. But there are *worthless* tenants who do *not* attend to it."

"I do not feel satisfied with the action of the council in regard to the matter; and at the request of a large number of residents, I make this report to you, with the request, that if possible, a representative from the State Board of Health be sent to investigate, and if the facts warrant, that some steps be taken to abate what I believe to be a serious menace to the health of the people of the village of Hudson."

In reply to Dr. Eaton's letter, the Secretary wrote to him June 23, 1890:

"I send you herewith a pamphlet in which I have marked paragraphs from which you will see that the council of every village has discretionary authority to assign places for the exercising of trades and employments offensive to the inhabitants or dangerous to the public health and to forbid the exercise thereof in places not so assigned. The local board of health itself has the power to cause a nuisance to be abated or removed at the expense of the owner if he neglects or refuses to act upon the orders of the board. But if the creamery is so situated as to make it impossible to abate the nuisance, the better course would be to assign some place for its being carried on, in accordance with the authority granted the village council.

"If the abatement of a nuisance involves much loss of property and there is any doubt about the alleged nuisance being a nuisance in fact, the safer course is to make complaint before the circuit court or the judge sitting in chambers, and secure an injunction for the abatement of the nuisance. In all matters pertaining to nuisances where there is not a plain, adequate and complete remedy at law, the circuit court for the county has equity jurisdiction to grant injunctions to stay or prevent nuisances."

POMACE FROM CIDER MILLS ALLEGED TO BE A NUISANCE.

Dr. E. D. Gardner, health officer of Richfield, Roscommon county, wrote to this office June 27, 1890:

"I have a nuisance in shape of a heap of pomace by a cider mill. It cannot be removed in present condition; but is a *terrible* nuisance. What would you recommend for disinfecting it?"

In reply to Dr. Gardner's question the Secretary wrote to him as follows, June 27, 1890:

"I have hardly sufficient facts before me as to the size of the pomace heap and the other conditions. I should think, however, that it might be buried under a layer of dry earth. I do not understand that the pomace is infected with the germs of any specific disease, and I think that copperas might be used as a deodorizer. If copperas water is to be used it should be prepared as described in the pamphlet sent herewith, which I have marked on page 3."

Geo. Walter, chairman of the board of health of Bridgewater township, Washtenaw county, wrote to this office July 13, 1890, as follows:

"I would like your opinion on the following: First, is the pomace left in a pile from a cider mill, in the country, considered a public nuisance and injurious to the public health, where there is no family living nearer than thirty rods from the mill? If so what course must I take to have it removed? The person owning the mill is not willing to remove it and there can be nothing collected from him to pay for having it moved, as the place is mortgaged for all it is worth. I have a case on hand of the kind. * * Please direct me what course to take and oblige."

July 16, 1890, the Secretary replied to Mr. Walter's letter as follows:

"At this distance, I cannot well judge whether the pomace of the cider mill is a nuisance or not; but if the nearest residence is thirty rods from the mill, it would seem to me not probable that it is a nuisance.

"I think this case would come under §7965, Howell's Statutes, which reads as follows:—'The circuit court for any county shall have equity jurisdiction in all matters concerning nuisances, where there is not a plain, adequate and complete remedy at law, and may grant injunctions to stay or prevent nuisances.'

"If your board of health thinks it important, you can apply to the circuit judge, or if *it* does not, any person aggrieved may so apply, for an injunction."

DISINFECTING PRIVY VAULTS.

Dr. H. L. Ash, health officer of Marion, Osceola county, in a letter addressed to the Secretary of this Board, dated June 26, 1890, asks:

"What shall be done when people refuse to disinfect privy vaults, etc., when notified by the local board of health? Please inform me by return mail and oblige."

In reply to Dr. Ash, the Secretary wrote to him June 30, 1890:

"I send you herewith a pamphlet in which I have marked paragraphs from which you will see that when the owner fails to comply with the orders of the board of health, the board may have a nuisance abated at the expense of the owner.

"It is my opinion that it would be better for the local board to look after the privies, and hire a man to disinfect them, rather than to order the work done by the owner.

"A distinction should be made between *deodorizers and disinfectants*. For a deodorizer copperas might be used as described in the marked paragraphs of pamphlet sent herewith. If the privies are infected, a disinfectant such as chloride of lime should be used in the manner indicated in another marked paragraph."

DISPOSITION OF SLOPS AND SWILL.

In a letter addressed to this Board, and dated June 30, 1890, Dr. W. L. Marks, health officer of Paris township, Kent county, writes:

"Can you suggest a good way of disposing of slops and swill? A part of our township is very thickly settled,—being adjacent to the city of Grand Rapids. We have no sewer to carry off slops, and they are thrown out upon the open ground, and in some cases barrels have been placed in the ground with the lower head out and a tube attached to pour in slops. But the ground soon becomes filled, and the water stands in pools on top of the ground, and the result is a stinking cess-pool. Can we oblige property owners to construct something to carry off such slops?

"If you can make any suggestions to help us out, they will be thankfully received."

Accompanying Dr. Marks letter, came the following printed document:

FOR THE PROTECTION OF HEALTH OF THE RESIDENTS OF PARIS TOWNSHIP.

It is hereby ordered that no swill or other filth be thrown out upon the streets or alleys, or upon the premises of any resident of said township except in covered barrels or boxes, kept for that purpose. Manure from stables must be put into covered boxes only, and the contents frequently removed. Where the dry earth system is not used, privy vaults must be cleaned and disinfected whenever they become foul, or, in the opinion of the health officer, dangerous to public health. The above regulations are in compliance with Sections 3 and 4 of Chapter 46, of the compiled laws of the State of Michigan, and will be vigorously enforced. Depositing manure, slops, swill and other filth, where rain and sunshine can reach them, may be, and in our opinion, is dangerous to public health.

Now, therefore, you are hereby ordered to remove________________________________ at your own expense, within twenty-four hours after the service of this notice upon you, under the penalty provided by law in case you neglect so to do.

By order of the Board of Health of Paris Township, Kent Co., Mich.

Dated this____day of____________189

________________________ Health Officer.

Whenever any such nuisance, source of filth, or cause of sickness shall be found on private property, the Board of Health shall order the owner or occupant thereof, at his own expense, to remove the same within twenty-four hours; and if the owner or occupant shall neglect so to do, he shall forfeit a sum not exceeding one hundred dollars. (Sec. 9, Compiled Laws of Michigan.)

Replying to Dr. Mark's letter, the Secretary of this Board wrote, July 1, 1890:

"I think the local board of health in a locality circumstanced as you describe, would do well to provide, at the expense of the township, a regular system of removal of garbage, including swill, and make, and publish regulations on that subject.

"The disposal of slop-water is more difficult; but, if care is taken to throw the water in a different place each day, it is possible to prevent nuisance, even on a small lot. If this is done, the printed order which you have sent me would probably have to be slightly changed, and I think it should be modified anyway to conform to the law, making it in the form of 'regulations,' under § 1636 and § 1639, Howell's Statutes.

"By this mail I send you a pamphlet containing those two sections marked."

HAS A HEALTH OFFICER POWER TO ABATE NUISANCES?

The following letter, received at this Office, from E. Stewart, M. D., health officer of Mendon, St. Joseph county, bears on this subject:

"Our village ordinances are not in working order and, such as they are, the Health Officer is not mentioned in them. The execution is all left to the Marshal. Now all this hot weather we have had very offensive slaughter-house nuisances, and the village authorities seem to be defied. Very soon I want to bring the State laws to bear upon them and would like to have the word and blow come as near together as possible. Will I have to wait to get the Prosecuting Attorney, or commence, and then notify him? Is it clear that I can cause the removal of pig-pens, cow-yards, manure piles and privy-vaults?"

July 2, 1890, the Secretary of this Board, replying to Dr. Stewart's letter, wrote:

"Concerning the nuisances, you ask: 'Is it clear that I can cause the removal of pig-pens, cow-yards, manure piles, and privy-vaults?' It is clear that *you* cannot, unless you are autherized by your local board. I send you herewith a pamphlet, marked to show the proper method. ([120.] pages 9-10.")

BONE FERTILIZER ALLEGED TO BE A NUISANCE.

July 9, 1890, Z. L. Baldwin, health officer of the village of Lawrence, wrote to the Secretary of this Board as follows:

"One of the village merchants has stored on his premises six or eight tons of pulverized bone fertiliser which has been complained of as a nuisance. At times the odor is quite offensive.

"I write you asking if the Board can enforce its removal, if the owner should refuse to remove it? I do not think it is particularly injurious to health.

"These bone factories operate in the midst of thickly settled cities, making it much more disagreeable than a repository would be.

"Please advise me."

In reply, the Secretary wrote to Dr. Baldwin, July 15, 1890:

"Relative to the pulverized bone fertilizer,—from this distance I cannot tell whether or not it is a nuisance; but if it is an undoubted nuisance the board of health can undoubtedly abate it. If there is question about its being a nuisance, it may be necessary to prove whether it is or not, in the circuit court or before the judge sitting in chambers—the law being as follows:

"'The circuit court for any county shall have equity jurisdiction in all matters concerning nuisances *where there is not a plain, adequate and complete remedy at law*, and may grant injunctions to stay or prevent nuisances.'—§ 7965, Howell's Statutes.

"By this mail I send you two pamphlets which will give you all the information which you require on this subject. I have marked paragraphs in the pamphlets bearing on the duties of the local board of health."

HOGS AND MANURE PILES NEAR RESIDENCES, ALLEGED TO BE NUISANCES.

B. Woodworth of Eagle, Clinton county, wrote to the Secretary of this Board, July 17, 1890, as follows:

"I write you to see if there is no way of removing hogs from within 12 feet of a man's door. A. Partlow has four large hogs and two manure piles within 12 feet of my door. I have asked him to remove them, and also notified our board of health, and they have paid little or no attention to me. The President of the board said to notify you and you would see to it right away.

"I would not ask it, but it smells so badly we cannot stand it. We live up stairs and there is no other house in town to rent, or I would move and not say a word. Now if there is any thing that can be done about it, without going to law, will you please attend to it for me?"

On receipt of Mr. Woodworth's letter, the Secretary wrote to the president of the village board of health of Eagle, as follows:

"Complaint reaches this office that an alleged nuisance exists in your village, as follows:—A. Partlow has four hogs and two manure piles within 12 feet of the door of B. Woodworth's residence.

"This seems to be a case on which the law requires the local board of health to act. Will your board have the kindness to investigate the alleged nuisance, take proper action, and inform me of the result?

"I herewith enclose two marked pamphlets giving the laws, etc., on the abatement of nuisances."

On the same date, the Secretary wrote to Mr. Woodworth as follows:

"In response to your letter of July 14, making complaint that 'A. Partlow has four hogs and two manure piles within 12 feet' of your door,—I, by this mail, write to the president of your village board of health giving the substance of your complaint, and informing him that this alleged nuisance seems to be one on which the law requires the local board of health to act, and also asking that the local board investigate the matter and take the proper action.

"I herewith enclose two marked pamphlets giving the laws, etc., on the abatement of nuisances."

December 10, 1890, the following document was received at this Office from citizens of Lowell, Kent county:

"*State Board of Health, Lansing, Mich.:*

"We, the undersigned, make the following statement to the State Board of Health:

"We have a dairy in our neighborhood, kept by D. E. Spring, who keeps 21 head of cattle, four hogs, three horses. He has a lot 8 rods by 12 rods, which contains one house, two barns and the above stock.

"His neighbors have nice, pleasant homes, and the above is not very healthy, and very unpleasant from the stench that arises from said yard, and does not add to the valuation.

"Three years ago we petitioned the board of health here to have it removed, by 12 petitioners. It was removed, but returned, and we have entered complaints ever since, but of no avail.

"The board of health say they cannot do anything, at least they won't; and D. E. Spring says he will do as he likes, for, as he says, his neighbors cannot do anything. And we ask the State Board of Health to interfere in our behalf.

"Please answer, and oblige.

(Signed),

WM. BURNETT,
JOHN S. EGGLESTON,
MARY J. TERWILLIGER."

December 12, 1890, the Secretary of this Board wrote to Mr. Burnett, one of the above named petitioners, as follows:

"In response to the statement, signed by Wm. Burnett, John S. Eggleston and Mary J. Terwilliger, in relation to an alleged nuisance in Lowell.—The law makes it the duty of the *local board of health* to investigate all alleged nuisances. In such an instance as this statement describes, I think the local board of health could reach the case if they would make and publish regulations. After having done this they could proceed against any person or persons violating the regulations.

"Where there is not a plain, adequate and complete remedy at law, the circuit court or the *circuit judge sitting in chambers*, has equity jurisdiction, and may grant an injunction to stay or abate the nuisance, and any person can apply for such injunction.

"I herewith enclose a pamphlet with marked paragraphs bearing upon this subject."

HAS A LOCAL BOARD OF HEALTH POWER TO CLOSE A CEMETERY?

The following letter, dated July 29, 1890, received by the Secretary of this Board, from John Anderson, Supervisor of Essex township, bears on this subject:

"The board of health of the township of Essex wish some information with regard to their powers in what they think is needful to the good of the public health.

"There is a cemetery inside the corporation of Maple Rapids village. There have been complaints entered to the board. We stuck up a notice forbidding any more interments; but no attention is paid to it. There have been three interments since we put up the notice. What we want to know is, have the board of health anything to do with this matter, and if they have what is it?

"Hope you will answer the above soon."

Replying to Mr. Anderson's letter, the Secretary wrote July 29, 1890:

"This seems to be an instance in which action should be taken by your board under § 7965, Howell's Statutes, which gives the Circuit Court *equity* jurisdiction in all matters concerning nuisances, where there is not a *plain, adequate, and complete* remedy at law; and authorizes the Circuit Court to grant injunctions to stay or prevent nuisances.

"Herewith I send you two pamphlets in which I have marked paragraphs bearing more especially on this subject."

SCHOOL-ROOM CONSIDERED UNHEALTHFUL.

July 30, 1890, A. E. Boylan, M. D., health officer of Brighton township, Livingston county, wrote to the Secretary of this Board as follows:

"I want some information in regard to our primary school. It is taught in the basement of the school-house. Room 25x25x8, with an attendance of sixty pupils, giving them about 83 cubic feet of air to the pupil. It has two windows on three sides for light and ventilation. The room being four feet below the surface, the windows necessarily reach to the ceiling, causing the pupils to catch cold. The building is warmed by a furnace in an adjoining room on the same floor, with smoke pipe to the chimney at one end being four feet from floor, the other one foot from ceiling, diagonally across the school-room one way, and hot-air pipe the other in very near the same shape. The board of trustees want to build or rent, and the citizens say that is good enough by their vote. The trustees want it condemned by the board of health, and want to know how to proceed."

In reply to Dr. Boylan's letter, the Secretary wrote to him, July 31, 1890:

"In my opinion, this is a case in which there is not a 'plain, adequate, and complete remedy at law,' and—The Circuit Court for any county shall have equity jurisdiction in all matters, where there is not a plain, adequate and complete remedy at law, and may grant injunctions to stay or prevent nuisances.—§ 7965 Howell's Statutes.

"I herewith enclose to you two marked pamphlets bearing on the subject of nuisances. I think the application for injunction should be made to the Judge of your circuit."

NOXIOUS WEEDS.

Mr. John Velte, member of the board of health of Woodland township, Barry county, wrote to the Secretary of this Board, August 8, 1890:

"What would your advice be concerning noxious weeds growing on the public highway? They are very thick in these parts and cause a great deal of what is called hay fever. I understand it to be the overseer's duty to cut them; but there is no weed cut in our township.

"Now I want to know the best way to get rid of them. Can the board of health regulate or not? Please to let me know."

In reply to Mr. Velte's letter the Secretary wrote, August 11, 1890:

"I think that perhaps as yet weeds are not a sufficiently well-recognized cause of hay fever to warrant the interference of the local board of health. However, of course, do as you think best. It would probably be well if it could be done."

DEAD HORSE FOUND ON NON-RESIDENT'S LAND.

Olton F. Otis, health officer of Day township, Montcalm county, wrote to the Secretary of this Board, August 11, 1890, asking information, as follows:

"Complaint was given me today of a dead horse found on a non-resident's land. The horse was turned into the road, sick, and died on above-mentioned land. As I cannot find the owner of the horse, how am I to proceed to have the horse buried? I do not wish to stand the expense of burial myself, and write you for some information, also I wish to do my duty."

In response to Mr. Otis, the Secretary wrote to him, August 11, 1890:

"The law does not directly confer upon the *health officer* power to abate any nuisance. His action relative to nuisances can be only such as he is empowered to take as executive officer of the local board of health.

"Section 1640, Howell's Statutes, requires *boards of health* to examine into all nuisances, sources of filth and causes of sickness that may, *in their opinion, be injurious to the health of inhabitants,* and destroy, remove, or prevent the same as the case may require *If a nuisance is found in a public place it is the duty of the board of health to see to its immediate removal.*

"I herewith enclose a pamphlet with marked paragraphs bearing on this subject."

IS THE MEAT OF A COW, KILLED IN A RAILROAD COLLISION, UNWHOLESOME?

The following letter, dated September 26, 1890, addressed to the State Board of Health, by W. K. Sawyer, Justice of the Peace, St. Joseph, was received at this office:

"I desire some information. A case is about to be brought before me, a Justice of the Peace, for the offense of selling diseased, corrupted or unwholsome provisions, in violation of Sec. 9316, of Howell's Statutes. I will state the case—A milch cow was struck by a railroad engine, one leg was broken, horns knocked off, flesh much bruised. She laid by the side of the railroad track from 4 to 6 hours, alive. The owner gave her to a butcher of this village. He killed her, put the meat in his market and sold it to people. He now admits that he sold it; but claims it was wholesome meat. Now what I wish to know is, was the meat diseased, corrupted, or unwholsome? and if unwholsome, why so? What changes from the time it was struck, to the time of killing, would make the meat unwholesome? If from fever, or what other change or cause?

"Can you cite me to cases that have been tried, or refer me to authorities, or give me your opinion as health experts?"

Replying to Mr. Sawyer's letter, the Secretary wrote, September 27, 1890:

"My own view is that a cow with 'one leg broken,' 'both horns knocked off,' 'flesh much bruised' and lying from 'four to six hours alive' would properly be called 'diseased,' and therefore be included in § 9316 Howell's Statutes.

"Replying to your questions in the order in which they are given: -

"(1) 'What changes would make the meat unwholesome?' That would depend upon circumstances; but there would be likely to be fever. The fever might be slight or sufficient to cause death of the animal, or any degree between those conditions. My opinion would be that the unwholesomeness of the meat would be likely to correspond with the extent of the fever; although, of course, some conditions might make the meat exceedingly unwholesome without there being very much fever.

"(2) 'What other change or cause would make it unwholesome?' The multiplication of septic micro-organisms within the body of the animal. The poisonous products of these micro-organisms might be sufficient to cause the death of the animal without there being much fever. Whether or not such micro-organisms should chance to be in the animal's body at the time of the injury, or should be inoculated into the body at the time of the injury would depend upon other conditions than the extent of the injury—that is to say, the meat might be poisonous from this cause with slight injury, and *might* be absent in case of great injury.

"(3) 'Can you cite me cases that have been tried?' No."

POLLUTION OF A CREEK BY REFUSE FROM A WOOD EXTRACT FACTORY.

October 20, 1890, W. C. Stitt, Commissioner of Highways, Perrinton, Gratiot county, wrote to the Secretary of this Board as follows:

"I hope you will pardon this intrusion upon your valuable time; but there exists in this locality a state of things which I think should be brought to the notice of your Honorable Board. There is in Perrinton an institution known as the 'Wood Extract Company' having their factory, or place of business located upon a stream of water known as Pine Creek, into which they run or throw the refuse and offal from their retorts, rendering the water—formerly pure as crystal—as black as ink, and very offensive to the sense of smell, killing all the fish, which at this writing are floating in large numbers on the surface of the water, but a few rods from the residence of the writer. H. L. Laycock and myself, this day, counted about a score, in the distance of a few feet along the bank. Now as this stream furnishes water for a large number of herds of sheep, horses and cattle, owned upon the farms traversed by it, what in your opinion will be the effect upon the stock? How will it affect the sanitary condition of the community? What are the steps necessary to be taken to have the nuisance—for such it is regarded by all whose farms are watered by the creek—abated? Do you think that milk from cows which drink of the water will be in anywise tainted with the poison?

"There have been two deaths of children which the attending physician—Dr. Coleman of Perrinton—pronounced as direct results of their drinking milk drawn from cows which had free access to the waters of the creek."

October 21, 1890, the Secretary wrote to Mr. Stitt as follows:

"Replying to your letter of October 20,—for the nuisance of which you complain, there is no 'plain adequate and complete remedy at law,' consequently the Circuit Court, or, if the Circuit Court is not in session, the Circuit Judge sitting in chambers, has equity jurisdiction, and may grant an injunction to stay or abate the nuisance. Application should be made to your Circuit Judge, setting forth the facts, and proving to him that there is need for his action.

"By this mail I send you two pamphlets marked, to show you what the law is."

In articles on alleged nuisances, published in previous Annual Reports of this Board, attention was called to the fact that a very large proportion of the communications received at this Office in regard to alleged nuisances, came from local health officers and other township, city and village officials, asking for information relative to points of law concerning nuisances, or requesting advice as to their duties, or to the proper legal procedure necessary to effect the prevention or abatement of nuisances. The correspondence of 1890, shows a similar desire on the part of local health officials for advice and coöperation of this Board, which has been freely and cheerfully given, and, it is believed, with beneficial results to the public health.

Copies of the revised edition of the compilation of the health laws of the State, including those which relate to nuisances, made by the Secretary of this Board; also of the laws of the State relating to nuisances,—in pamphlet form—may be obtained by those concerned, on application to the Secretary of the State Board of Health.

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ERRATA.

Page xii, first sub-head, at end of line, for 1891 read 1890.

Page xli, in second line of last sub-head, near end of line, for October 13, read September 30.

Page xciv, second column, second line of italics, for Sheed read Shedd.

Page 6, in second line of heading to Exhibit 6, for 1880 read 1890.

Page 10, in first line of third paragraph, after "Diagram No. 1," for (p.) read (p. 22).

Page 77, in the first column of figures, all the averages are wrong: for $1.60\overset{3}{6}$ read $.97\overset{3}{2}$; for $1.20\overset{9}{9}$ read $.97\overset{9}{1}$; for $1.62\overset{6}{9}$ read $.99\overset{6}{5}$; for $1.23\overset{7}{9}$ read $.95\overset{7}{8}$; for $1.18\overset{8}{6}$ read $.91\overset{8}{8}$; for $1.14\overset{9}{7}$ read $.91\overset{9}{8}$; for $1.42\overset{4}{9}$ read $.94\overset{4}{6}$; for $1.14\overset{9}{0}$ read $.91\overset{9}{5}$; for $1.16\overset{8}{6}$ read $.90\overset{8}{6}$.

Page 93, in line at bottom of Exhibit IV, "No. of reports rec'd," total for 1886, for 5,683 read 5,583.

Page 97, under "Central Division," in twenty-third line, for L. E. Higby read L. E. Higbee.

Page 119, in first line of heading, first word, for Table IX read Exhibit IX.

Page 157, in third paragraph of nonpareil, last line, for Chesire read Cheshire.

Page 158, in Table 5, under "Montmorency Co.," for Vienna village read Vienna township.

Page 158, in Table 5, under Oakland Co., for Drayton Plains read Drayton Plains, Waterford township.

Page 158, in Table 5, under Lapeer Co., for Columbia read Columbiaville.

Page 160, in last line of nonpareil, for D. Patterson read D. Patterson, M. D.

Page 165, between the last nonpareil paragraph and the sub-head "Practical Results in Restricting Diphtheria," read the last four paragraphs on page 166.

Page 166, in reading omit last four paragraphs; they should have been printed on page 165.

Page 190, in last line of heading for Table 1, for eight read nine.

Page 190, in seventh line from bottom of page, end of line, for more read less.

Page 190, in last line of heading for Table 2, for five read six.

Page 195, in first line of heading of Table 4, fourth and eleventh words, for four read five.

Page 198, in eleventh paragraph, second line, for Palo read Ronald township.

Page 199, in seventh paragraph, second line, for Deerfield read Deerfield township, Livingston county.

Page 199, in twenty-eighth paragraph, for Buena Vista read Buena Vista township.

Page 203, in second column of Table 5, under "Delta Co.," for Ford River read Ford River township.

Page 204, in first column of Table 5, under "Oakland Co.," for West Bloomfield read West Bloomfield township.

Page 204, in second column of Table 5, under "Lapeer Co.", for Columbia village read Columbiaville.

Page 205, in first column of Table 5, under "Tuscola Co.", for Watrousville village read Watrousville, Juniata township.

Page 221, in third paragraph of long primer type, first line, for F. M. Kerry read F. M. Kerry, M. D.

Page 236, in first line of long primer type, for Wm. G. Saunders, read Wm. G. Saunders, M. D.

Page 243, in first column of Table 5, under "Crawford Co.," for Grayling city read Grayling, Grayling township.

Page 243, in second column of Table 5, under "Jackson Co.," for Spring Arbor read Spring Arbor township.

Page 244, in first column of Table 5, under "Oakland Co.," for South Lyons read South Lyon.

Page 244, in second column, for Baraga county, Midville village read Barry County, Middleville village.

Page 252, in second paragraph of long primer type at end of first line, for Geo. D. Slocum read Geo. D. Slocum, M. D.

Page 264, in first line of long primer type, for G. O. Switzer read G. O. Switzer, M. D.

Page 282, in second line of long primer type, for Richfield, Roscommon county, read Richfield township, Genesee county.

Page 284, in third line of long primer type from bottom of page, for Z. L. Baldwin read Z. L. Baldwin, M. D.

Page 297, index, after Carey, M. D., Howard, insert line to read:

Cargill, H. N., reports from, relative to outbreak of small-pox 235-236

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